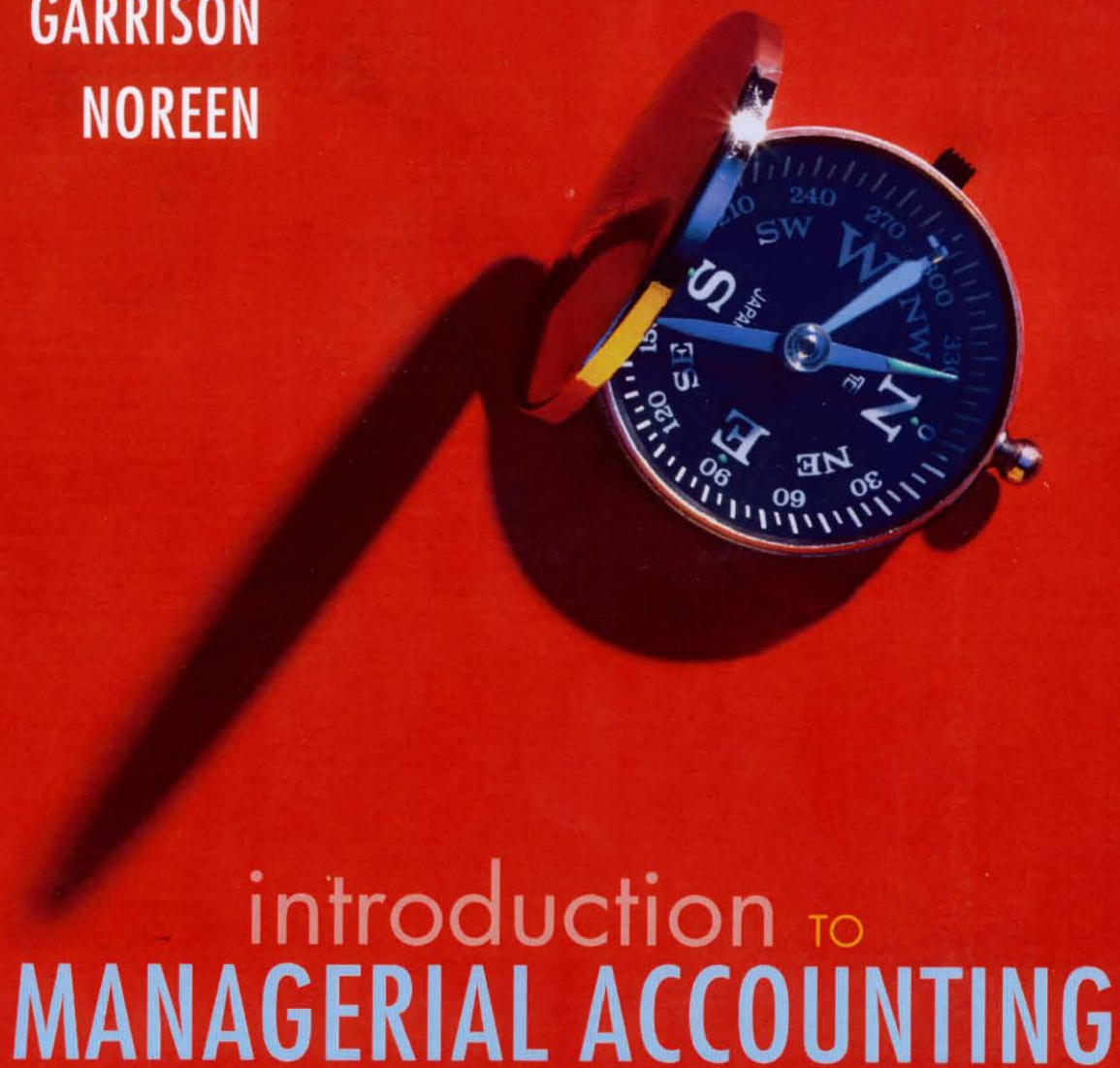


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Custom Edition for
ACC 201 Managerial Accounting

DEDICATION

To our families and to our colleagues who use this book.

—Peter C. Brewer, Ray H. Garrison, and Eric W. Noreen

About the Authors



Peter C. Brewer is a professor in the Department of Accountancy at Miami University, Oxford, Ohio. He holds a BS degree in accounting from Penn State University, an MS degree in accounting from the University of Virginia, and a PhD from the University of Tennessee. He has published more than 30 articles in a variety of journals including: *Management Accounting Research*, the *Journal of Information Systems*, *Cost Management*, *Strategic Finance*, the *Journal of Accountancy*, *Issues in Accounting Education*, and the *Journal of Business Logistics*.

Professor Brewer is a member of the editorial boards of *Issues in Accounting Education* and the *Journal of Accounting Education*. His article “Putting Strategy into the Balanced Scorecard” won the 2003 International Federation of Accountants’ Articles of Merit competition and his articles “Using Six Sigma to Improve the Finance Function” and “Lean Accounting: What’s It All About?” were awarded the Institute of Management Accountants’ Lybrand Gold and Silver Medals in 2005 and 2006. He has received Miami University’s Richard T. Farmer School of Business Teaching Excellence Award and has been recognized on two occasions by the Miami University Associated Student Government for “making a remarkable commitment to students and their educational development.” He is a leading thinker in undergraduate management accounting curriculum innovation and is a frequent presenter at various professional and academic conferences.

Prior to joining the faculty at Miami University, Professor Brewer was employed as an auditor for Touche Ross in the firm’s Philadelphia office. He also worked as an internal audit manager for the Board of Pensions of the Presbyterian Church (U.S.A.). He frequently collaborates with companies such as Harris Corporation, Ghent Manufacturing, Cintas, Ethicon Endo-Surgery, Schneider Electric, Lenscrafters, and Fidelity Investments in a consulting or case writing capacity.



Ray H. Garrison

is emeritus professor of accounting at Brigham Young University, Provo, Utah. He received his BS and MS degrees from Brigham Young University and his DBA degree from Indiana University.

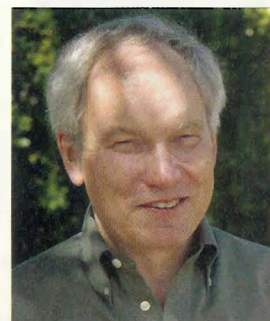
As a certified public accountant, Professor Garrison has been involved in management consulting work with both national and regional accounting firms. He has published articles in *The Accounting Review*, *Management Accounting*, and other professional journals. Innovation in the classroom has earned Professor Garrison the Karl G. Maeser Distinguished Teaching Award from Brigham Young University.

Eric W. Noreen has held appointments at institutions in the United States, Europe, and Asia. He is emeritus professor of accounting at the University of Washington.

He received his BA degree from the University of Washington and MBA and PhD degrees from Stanford University. A Certified Management Accountant, he was awarded a Certificate of Distinguished Performance by the Institute of Certified Management Accountants.

Professor Noreen has served as associate editor of *The Accounting Review* and the *Journal of Accounting and Economics*. He has numerous articles in academic journals including: the *Journal of Accounting Research*; *The Accounting Review*; the *Journal of Accounting and Economics*; *Accounting Horizons*; *Accounting, Organizations and Society*; *Contemporary Accounting Research*; the *Journal of Management Accounting Research*; and the *Review of Accounting Studies*.

Professor Noreen has taught management accounting at the undergraduate and master's levels and has won a number of awards from students for his teaching.



Pointing Students in the Right Direction

“Why do I need to learn Managerial Accounting?”

Brewer's *Introduction to Managerial Accounting* has earned a reputation as the most concise and readable book on the market. Its manageable chapters and clear presentation point students toward understanding just as the needle of a compass provides direction to travelers.

However, the book's authors also understand that everyone's destinations are different. Some students will become accountants, while others are destined for careers in management, marketing, or finance. Not only does the Brewer text teach students managerial accounting concepts in a clear and concise way, but it also asks students to consider how the concepts they're learning will apply to the real world situations they will eventually confront in their careers. This combination of conceptual understanding and the ability to apply that knowledge directs students toward success, whatever their final destination happens to be.

Here's how your colleagues have described Brewer's *Introduction to Managerial Accounting*:

Better than other texts, Brewer is written in a manner that fosters a more mature level of thinking in the student. When the “whys” and the usefulness of concepts are presented so well, it makes my job so much easier.

—M. David Gorton, Eastern Washington University

... This book is **so well written** that it is easy for the students to read the text and then be able to work exercises and problems at the end of the chapter. The topics covered do **a great job of preparing business students** for their upper level business courses and it lays a strong foundation for the accounting majors who will take cost accounting. This book has so many resources for students to go along with the text that you can individually fit the needs of almost any student. **I would highly recommend this book** for any managerial accounting principle class.

—Joseph M. Hagan, East Carolina University

This textbook presents fundamental managerial accounting concepts in **a very clear and concise manner** and offers many effective mechanisms (e.g., end-of-chapter problems and cases; on-line quizzes, videos, and slideshows) that help students reinforce the concepts.

—Nace Magner, Western Kentucky University

It is an excellent book. Clearly written and comprehensive. Students are able to understand the material.

—Anwar Y. Salimi, California State Polytechnic University-Pomona

Introduction to Managerial Accounting, 5th edition, by **BREWER/GARRISON/NOREEN** empowers your students by offering:

CONCISE COVERAGE

Your students want a text that is concise and that presents material in a clear and readable manner. *Introduction to Managerial Accounting* keeps the material accessible while avoiding advanced topics related to cost accounting. Students' biggest concern is whether they can solve the end-of-chapter problems after reading the chapter. Market research indicates that Brewer/Garrison/Noreen helps students apply what they've learned better than any other managerial accounting text on the market. Additionally, the key supplements are written by the authors ensuring that students and instructors will work with clear, well-written supplements that employ consistent terminology.

DECISION-MAKING FOCUS

All students who pass through your class need to know how accounting information is used to make business decisions, especially if they plan to be future managers. That's why Brewer, Garrison and Noreen make decision making a pivotal component of *Introduction to Managerial Accounting*. In every chapter you'll find the following key features that are designed to teach your students how to use accounting information. **Decision Maker** and **You Decide Boxes** help students to develop analytical, critical thinking, and problem-solving skills. **Building Your Skills** cases challenge students' decision-making skills.

A CONTEMPORARY APPROACH TO LEARNING

Today's students rely on technology more than ever as a learning tool, and *Introduction to Managerial Accounting* offers the finest technology package of any text on the market. From study aids to online grading and course management, our technology assets have one thing in common: they make your class time more productive, more stimulating, and more rewarding for you and your students. McGraw-Hill's *Connect Accounting* is an online assignment and assessment solution that connects students with the tools and resources they'll need to achieve success. *Connect Plus*[™] provides an online version of the text in addition to access to *Connect*, giving students a convenient way to access everything they need to succeed in their course. The Online Learning Center provides your students with a variety of multimedia aids to help them learn managerial accounting. McGraw-Hill's *Media Integration* allows students to maximize the technological package available to them with Brewer. Apple® iPod® icons throughout the text link content back to quizzes, audio and visual lecture presentations, and course-related videos—all of which can be downloaded to their iPod or other portable MP3/MP4 players so they can study and review on the go.



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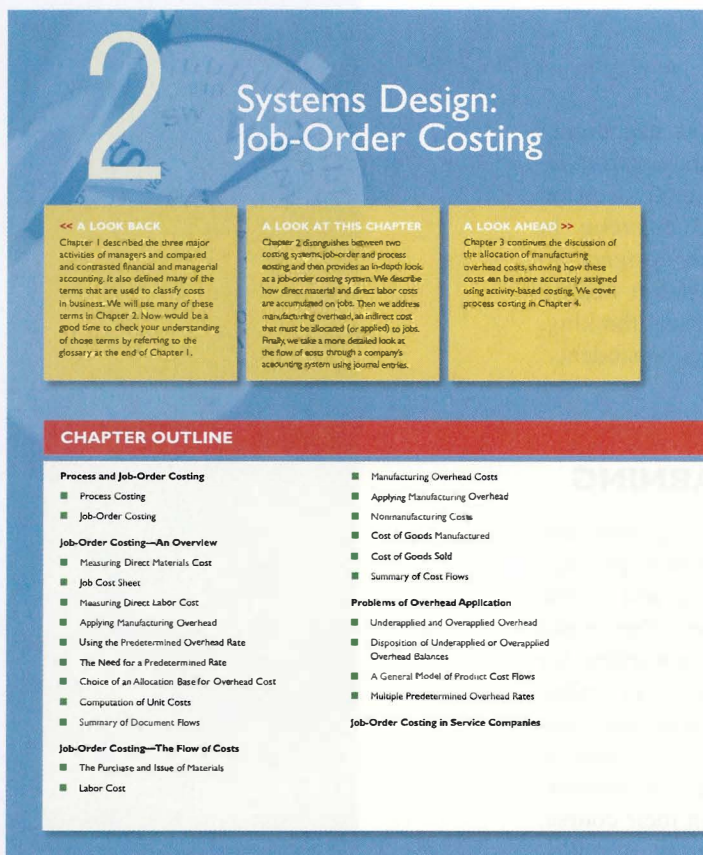
Introduction to Managerial Accounting is full of pedagogy designed to make studying productive and hassle-free. On the following pages, you'll see the kind of engaging, helpful pedagogical features that have made Brewer one of the best-selling Managerial Accounting texts on the market.

CHAPTER OUTLINE

Each chapter opens with an **outline** that provides direction to the student about the road they can expect to traverse throughout the chapter. The **A Look** feature reminds students what they have learned in previous chapters, what they can expect to learn in the current chapter, and how the topics will build on each other in chapters to come.

DECISION FEATURE

The **Decision Feature** at the beginning of each chapter provides a real-world example for students, allowing them to see how the chapter's information and insights apply to the world outside the classroom. **Learning Objectives** alert students to what they should expect as they progress through the chapter.



2 Systems Design: Job-Order Costing

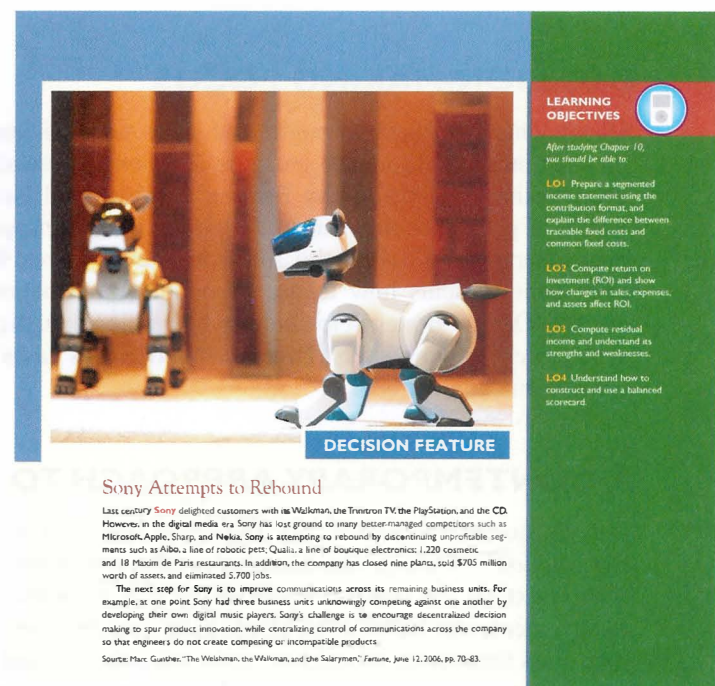
<< A LOOK BACK
Chapter 1 described the three major activities of managers and compared and contrasted financial and managerial accounting. It also defined many of the terms that are used to classify costs in business. We will use many of these terms in Chapter 2. Now would be a good time to check your understanding of those terms by referring to the glossary at the end of Chapter 1.

A LOOK AT THIS CHAPTER
Chapter 2 distinguishes between two costing systems: job-order and process costing and then provides an in-depth look at a job-order costing system. We describe how direct material and direct labor costs are accumulated on jobs. Then we address manufacturing overhead, an indirect cost that must be allocated (or applied) to jobs. Finally, we take a more detailed look at the flow of costs through a company's accounting system using journal entries.

A LOOK AHEAD >>
Chapter 3 continues the discussion of the allocation of manufacturing overhead costs, showing how these costs can be more accurately assigned using activity-based costing. We cover process costing in Chapter 4.

CHAPTER OUTLINE

- Process and Job-Order Costing
 - Process Costing
 - Job-Order Costing
- Job-Order Costing—An Overview
 - Measuring Direct Materials Cost
 - Job Cost Sheet
 - Measuring Direct Labor Cost
 - Applying Manufacturing Overhead
 - Using the Predetermined Overhead Rate
 - The Need for a Predetermined Rate
 - Choice of an Allocation Base for Overhead Cost
 - Computation of Unit Costs
 - Summary of Document Flows
- Job-Order Costing—The Flow of Costs
 - The Purchase and Issue of Materials
 - Labor Cost
 - Manufacturing Overhead Costs
 - Applying Manufacturing Overhead
 - Nonmanufacturing Costs
 - Cost of Goods Manufactured
 - Cost of Goods Sold
 - Summary of Cost Flows
- Problems of Overhead Application
 - Underapplied and Overapplied Overhead
 - Disposition of Underapplied or Overapplied Overhead Balances
 - A General Model of Product Cost Flows
 - Multiple Predetermined Overhead Rates
- Job-Order Costing in Service Companies



LEARNING OBJECTIVES

After studying Chapter 10, you should be able to:

- LO1 Prepare a segmented income statement using the contribution format, and explain the difference between traceable fixed costs and common fixed costs.
- LO2 Compute return on investment (ROI) and show how changes in sales, expenses, and assets affect ROI.
- LO3 Compute residual income and understand its strengths and weaknesses.
- LO4 Understand how to construct and use a balanced scorecard.

DECISION FEATURE

Sony Attempts to Rebound

Last century Sony delighted customers with its Walkman, the Trinitron TV, the PlayStation, and the CD. However, in the digital media era Sony has lost ground to many better-managed competitors such as Microsoft, Apple, Sharp, and Nokia. Sony is attempting to rebound by discontinuing unprofitable segments such as Aibo, a line of robotic pet; Quasi, a line of boutique electronics; i.220 cosmetics; and 18 Maxim de Paris restaurants. In addition, the company has closed nine plants, sold \$705 million worth of assets, and eliminated 5,700 jobs.

The next step for Sony is to improve communications across its remaining business units. For example, at one point Sony had three business units unknowingly competing against one another by developing their own digital music players. Sony's challenge is to encourage decentralized decision making to spur product innovation, while centralizing control of communications across the company so that engineers do not create competing or incompatible products.

Source: Marc Guithe, "The Walkman, the Walkman, and the Salaryman," *Fortune*, June 12, 2006, pp. 70-83.

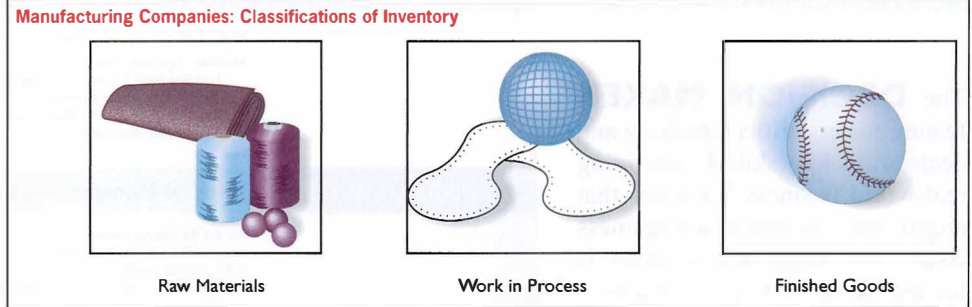
Each section of the chapter's outline has an introduction about the business aspect of the topic and gets the reader engaged before the topic is covered.

— Kathy Crusto-Way, Tarrant County College

POWERFUL PEDAGOGY

INFOGRAPHICS

Infographics and exhibits help students visualize key accounting concepts, such as Static versus Flexible Budgets, the Activity-Based Costing Model, and Management by Exception.



*These real world business situations are extremely helpful. These **help students see the application of managerial accounting to real business operations.** It also helps students to see that since the world is constantly changing, that the applications employed must be adapted in response to the changing environment.*

—Agatha E. Jeffers, Montclair State University

IN BUSINESS BOXES

These helpful boxed features offer a glimpse into how real companies use the managerial accounting concepts discussed within the chapter. Every chapter contains these current examples.

IN BUSINESS

Skyrocketing Transportation Costs Affect Direct Materials Standards

Direct materials price standards should reflect the final delivered cost of the materials. Given increases in the costs of shipping raw materials across oceans, many companies have increased their price standards. For example, the average cost to rent a ship to transport raw materials from Brazil to China has increased from \$65,000 to \$180,000. In some instances, shipping costs now exceed the cost of the cargo itself. It costs about \$88 to ship a ton of iron ore from Brazil to Asia; however, the iron ore itself only costs \$60 per ton.

Source: Robert Guy Matthews, "Ship Shortage Pushes Up Prices of Raw Materials," *The Wall Street Journal*, October 22, 2007, p. A1 and A12.

1. The standard and actual prices per pound of raw material are \$4.00 and \$4.50, respectively. A total of 10,500 pounds of raw material was purchased and then used to produce 5,000 units. The quantity standard allows two pounds of the raw material per unit produced. What is the materials quantity variance?
 - a. \$5,000 unfavorable
 - b. \$5,000 favorable
 - c. \$2,000 favorable
 - d. \$2,000 unfavorable
2. Referring to the facts in question 1 above, what is the material price variance?
 - a. \$5,250 favorable
 - b. \$5,250 unfavorable
 - c. \$5,000 unfavorable
 - d. \$5,000 favorable



CONCEPT CHECK

Concept Checks allow students to test their comprehension of topics and concepts covered at various stages throughout each chapter.

The **DECISION MAKER** feature fosters critical thinking and decision-making skills by providing real-world business scenarios that require the resolution of a business issue. The suggested solution is located at the end of the chapter.

DECISION MAKER

General Manager of a Luxury Resort

Rick: I think I understand, but it *is* confusing.

Victoria: Just remember that a cost is called variable if it is proportional to activity; it is called fixed if it does not depend on the level of activity. However, fixed costs can change for reasons unrelated to changes in the level of activity. And controllability has little to do with whether a cost is variable or fixed. Fixed costs are often more controllable than variable costs.

You are the general manager of a 200-room luxury resort in Arizona and are responsible for all aspects of operations. The budget for the current month called for total revenue from room rentals of \$2,362,500 based on 5,625 room-days. (A room-day is a room rented for one day.) The actual revenue from room rentals for the month amounted to \$2,502,800 for 6,250 room-days. Using the flexible budget approach, analyze these results.

Performance Reports in Nonprofit Organizations

The performance reports in nonprofit organizations are basically the same as the performance reports we have considered so far—with one prominent difference. Nonprofit organizations usually receive a significant amount of funding from sources other than sales. For example, universities receive their funding from sales (i.e., tuition charged to students), from endowment income and donations, and—in the case of public universities—from state appropriations. This means that, like costs, the revenue in governmental and nonprofit organizations may consist of both fixed and variable elements.

**Rick's Hairstyling
Revenue and Spending Variances
For the Month Ended March 31**

	Flexible Budget	Actual Results	Revenue and Spending Variances
Client-visits.....	1,100	1,100	
Revenue (\$180.00q).....	<u>\$198,000</u>	<u>\$194,200</u>	<u>\$3,800 U</u>
Expenses:			
Wages and salaries (\$65,000 + \$37.00q)	105,700	106,900	1,200 U
Hairstyling supplies (\$1.50q).....	1,650	1,620	30 F
Client gratuities (\$4.10q).....	4,510	6,870	2,360 U
Electricity (\$1,500 + \$0.10q).....	<u>1,610</u>	<u>1,550</u>	<u>60 F</u>
Rent (\$28,500).....	28,500	28,500	0
Liability insurance (\$2,800).....	2,800	2,800	0
Employee health insurance (\$21,300).....	21,300	22,600	1,300 U
Miscellaneous (\$1,200 + \$0.20q).....	1,420	2,130	710 U
Total expense.....	<u>167,490</u>	<u>172,970</u>	<u>5,480 U</u>
Net operating income.....	<u>\$ 30,510</u>	<u>\$ 21,230</u>	<u>\$9,280 U</u>

EXHIBIT 8-6
Revenue and Spending Variances
from Comparing the Flexible
Budget to the Actual Results

between how much a cost should have been, given the actual level of activity, and the actual amount of the cost. If the actual cost is greater than what the cost should have been, the variance is labeled as unfavorable. If the actual cost is less than what the cost should have been, the variance is labeled as favorable. Why would a cost have a favorable or unfavorable variance? There are many possible explanations including paying a higher price for inputs than should have been paid, using too many inputs for the actual level of activity, a change in technology, and so on. In the next chapter we will delve into this topic in greater detail.

Note from Exhibit 8-6 that the overall net operating income variance is \$9,280 U (unfavorable). This means that given the actual level of activity for the period, the net operating income was \$9,280 lower than it should have been. There are a number of reasons for this. The most prominent is the unfavorable revenue variance of \$3,800. Next in line is the \$2,360 unfavorable variance for client gratuities. Looking at this in another way, client gratuities were more than 50% larger than they should have been according to the flexible budget. This is a variance that Rick would almost certainly want to investigate further. Rick may directly control the client gratuities himself. If not, he may want to know who authorized the additional expenditures. Why were they so large? Was more given away than usual? If so, why? Were more expensive gratuities given to clients? If so, why? Note that this unfavorable variance is not necessarily a bad thing. It is possible, for example, that more lavish use of gratuities led to the 10% increase in client-visits.

The **YOU DECIDE** feature challenges students to apply the tools of analysis and make decisions. The suggested solution is found at the end of the chapter.

Owner of Micro-Brewery

YOU DECIDE

Hops is an essential ingredient in beer. The brewery's budget for the current month, which was based on the production of 800 barrels of beer, allowed for an expense of \$960 for hops. The actual production for the month was 850 barrels of beer and the actual cost of the hops used to produce that beer was \$1,020. Hops is a variable cost. Do you think the expense for hops for the month was too high?



UTILIZING THE ICONS



To reflect our service-based economy, the text is replete with examples from service-based businesses. A helpful icon distinguishes service-related examples in the text.



Ethics assignments and examples serve as a reminder that good conduct is vital in business. Icons call out content that relates to ethical behavior for students.



Media integrated icons throughout the text link content back to chapter-specific quizzes, audio lectures, and visual presentations; all of which can be downloaded to an MP3 player. This gives students access to a portable, electronic learning option to support their classroom instruction.



The writing icon denotes problems that require students to use critical thinking as well as writing skills to explain their decisions.



An Excel[®] icon alerts students that spreadsheet templates are available for use with select problems and cases.



The IFRS icon highlights content that may be affected by the impending change to IFRS and possible convergence between U.S. GAAP and IFRS.

END-OF-CHAPTER MATERIAL

Introduction to Managerial Accounting has earned a reputation for the best end-of-chapter review and discussion material of any text on the market. Our problem and case material conforms to AICPA, AACSB, and Bloom's Taxonomy categories and makes a great starting point for class discussions and group projects. With discussion questions, brief exercises, exercises, problems, cases, and research and application problems, Brewer offers students practice material of varying complexity and depth. In order to provide even more practice opportunities, an **alternate problem set** is available on the text's website along with online quizzes and practice exams.

AUTHOR-WRITTEN SUPPLEMENTS

Unlike other managerial accounting texts, Brewer, Garrison, and Noreen write all of the text's major supplements, ensuring a perfect fit between text and supplements. For more information on *Introduction to Managerial Accounting's* supplements package see pages xiv–xviii.

A great text with **numerous real world examples to help apply material to the decision making process.** Students will find it easy to read and to follow in working end of chapter assignments. Provides the instructor with the tools to help increase classroom discussion on chapter topics with real world applications.

—Terry G. Elliott, Morehead State University

New to the 5th edition

An **excellent book** for an
Introductory Managerial Course
for all business students, not
just Accounting majors.

—Tamara Phelan, Northern Illinois
University

This is a great text and I
strongly recommend it to
first time students in the area of
managerial accounting.

—Luther L. Ross, Central Piedmont
Community College

Faculty feedback helps us continue to improve *Introduction to Managerial Accounting*. In response to reviewer suggestions we have:

- Reordered variances in Chapters 8 and 9. Both chapters have been extensively rewritten to follow a more logical flow.
- Added coverage of Corporate Social Responsibility to Chapter 2 to introduce students to an important and relevant topic in today's business world; moved the coverage of balanced scorecard to Chapter 10 where it more naturally belongs.
- Added International Financial Reporting Standards (IFRS) icons throughout the text to highlight topics that may be affected should the U.S. adopt IFRS in the future.

Specific changes were made in the following chapters:

- In Business boxes updated throughout.
- All end-of-chapter items tagged to Bloom's Taxonomy categories as well as AACSB and AICPA standards.

Prologue

- Materials dealing with the distinction between financial and managerial accounting have been moved to Chapter 2.
- The section on Technology in Business has been eliminated.
- New material on Corporate Social Responsibility has been added.

Chapter 1

- The Schedule of Cost of Goods Manufactured has been simplified by eliminating the list of the elements of Manufacturing Overhead. This removes a discrepancy that had existed between the coverage of the Schedule of Cost of Goods Manufactured in Chapter 1 and in Chapter 2.

Chapter 2

- Portions of the chapter have been rewritten to enhance clarity.

Chapter 4

- Preparing the Cost Reconciliation Report is now a Learning Objective.

Chapter 5

- All of the end-of-chapter materials for the Variable Costing appendix have been moved to the end of the appendix to make the appendix more self-contained.

Chapter 6

- The basic equations used in target profit analysis and break-even analysis have been revised to be more intuitive.
- Break-even analysis has been moved to follow target profit analysis because break-even analysis is just a special case of target profit analysis.
- Profit graphs are covered in addition to CVP graphs.

Chapter 8

- This chapter has been completely rewritten to follow a logical path leading from budgeting to performance evaluation comparing budgets to actual results and then on to standard cost analysis. Flexible budgets are used to prepare performance reports with activity variances and revenue and spending variances. This chapter contains some of the material that used to be in Chapter 9.

Chapter 9

- This chapter now covers all standard cost variances—including fixed manufacturing overhead variances in an appendix. The material in this chapter has been extensively rewritten—particularly the materials dealing with manufacturing overhead. This chapter contains material that used to be in Chapter 8.

Chapter 10

- The materials dealing with the Balanced Scorecard have been expanded and have been moved to this chapter, where they more naturally belong.
- The Segmented Income Statement is covered in much more depth.

Chapter 13

- Free cash flow has been added to the chapter.
- The exercises and problems for the appendix have been moved so that they follow the appendix.

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Connect Accounting offers a number of powerful tools and features to make managing assignments easier, so faculty can spend more time teaching. With *Connect Accounting*, students can engage with their coursework anytime and anywhere, making the learning process more accessible and efficient. *Connect Accounting* offers you the features described below.

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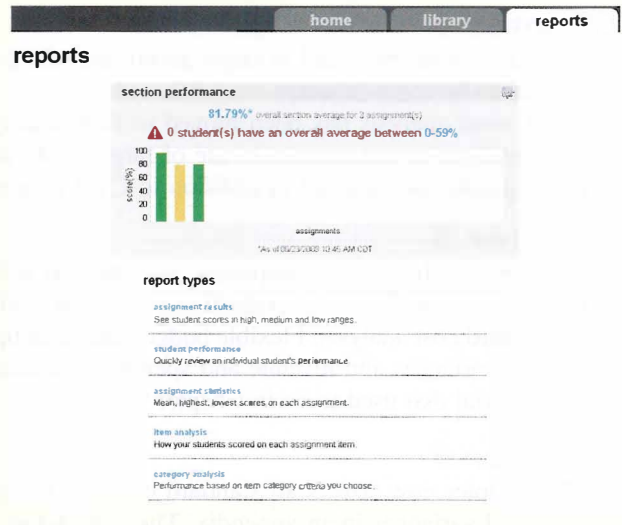
With *Connect Accounting*, creating assignments is easier than ever, so you can spend more time teaching and less time managing. The assignment management function enables you to:

- Create and deliver assignments easily with selectable end-of-chapter questions and test bank items.
- Streamline lesson planning, student progress reporting, and assignment grading to make classroom management more efficient than ever.
- Go paperless with the eBook and online submission and grading of student assignments.

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When it comes to studying, time is precious. *Connect Accounting* helps students learn more efficiently by providing feedback and practice material when they need it, where they need it. When it comes to teaching, your time also is precious. The grading function enables you to:

- Have assignments scored automatically, giving students immediate feedback on their work and side-by-side comparisons with correct answers.
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Instructor library

The *Connect Accounting* Instructor Library is your repository for additional resources to improve student engagement in and out of class. You can select and use any asset that enhances your lecture. The *Connect Accounting* Instructor Library includes:

- PowerPoints
- Transparency Masters
- Bonus Variable Costing chapter
- FIFO Supplement chapter



Student study center

The *Connect Accounting* Student Study Center is the place for students to access additional resources. The Student Study Center:

- Offers students quick access to lectures, practice materials, eBooks, and more.
- Provides instant practice material and study questions, easily accessible on the go.
- Gives students access to the Personalized Learning Plan described next.

Personalized Learning Plan

The Personalized Learning Plan (PLP) connects each student to the learning resources needed for success in the course. For each chapter, students:

- Take a practice test to initiate the Personalized Learning Plan.
- Immediately upon completing the practice test, see how their performance compares to chapter learning objectives or content by sections within chapters.
- Receive a Personalized Learning Plan that recommends specific readings from the text, supplemental study material, and practice work that will improve their understanding and mastery of each learning objective.

Diagnostic and adaptive learning of concepts: LearnSmart

Students want to make the best use of their study time. The LearnSmart adaptive self-study technology within *Connect Accounting* provides students with a seamless combination of practice, assessment, and remediation for every concept in the textbook. LearnSmart's intelligent software adapts to every student response and automatically delivers concepts that advance the student's understanding while reducing time devoted to the concepts already mastered. The result for every student is the fastest path to mastery of the chapter concepts. LearnSmart:

- Applies an intelligent concept engine to identify the relationships between concepts and to serve new concepts to each student only when he or she is ready.
- Adapts automatically to each student, so students spend less time on the topics they understand and practice more those they have yet to master.
- Provides continual reinforcement and remediation, but gives only as much guidance as students need.
- Integrates diagnostics as part of the learning experience.
- Enables you to assess which concepts students have efficiently learned on their own, thus freeing class time for more applications and discussion.

Student progress tracking

Connect Accounting keeps instructors informed about how each student, section, and class is performing, allowing for more productive use of lecture and office hours. The progress-tracking function enables you to:

- View scored work immediately and track individual or group performance with assignment and grade reports.
- Access an instant view of student or class performance relative to learning objectives.
- Collect data and generate reports required by many accreditation organizations, such as AACSB and AICPA.

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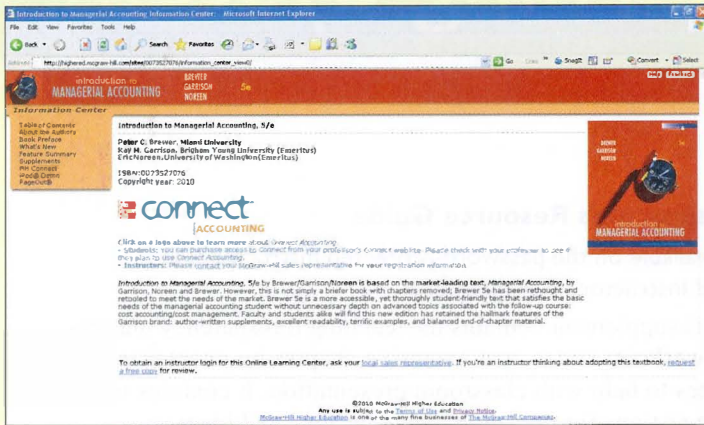
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Acknowledgments

Suggestions have been received from many of our colleagues throughout the world who have used the prior edition of *Introduction to Managerial Accounting*. This is vital feedback that we rely on in each edition. Each of those who have offered comments and suggestions has our thanks.

The efforts of many people are needed to develop and improve a text. Among these people are the reviewers and consultants who point out areas of concern, cite areas of strength, and make recommendations for change. We thank current and past reviewers who have provided feedback that was enormously helpful in preparing *Introduction to Managerial Accounting*.

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We are grateful for the outstanding support from McGraw-Hill/Irwin. In particular, we would like to thank Stewart Mattson, Editorial Director; Tim Vertovec, Publisher; Emily Hatteberg, Developmental Editor; Pat Frederickson, Lead Project Manager; Debra Sylvester, Lead Production Supervisor; Matt Baldwin, Lead Designer Brian Nacik, Lead Media Project Manager; and Lori Kramer, Senior Photo Research Coordinator.

Finally, we would like to thank Beth Woods for working so hard to ensure an error-free fifth edition.

We are grateful to the Institute of Certified Management Accountants for permission to use questions and/or unofficial answers from past Certificate in Management Accounting (CMA) examinations. Likewise, we thank the American Institute of Certified Public Accountants, the Society of Management Accountants of Canada, and the Chartered Institute of Management Accountants (United Kingdom) for permission to use (or to adapt) selected problems from their examinations. These problems bear the notations CMA, CPA, SMA, and CIMA, respectively.

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CONTENTS

PROLOGUE

Managerial Accounting and the Business Environment 1

GLOBALIZATION	2
STRATEGY	4
ORGANIZATIONAL STRUCTURE	5
Decentralization	5
The Functional View of Organizations	5
PROCESS MANAGEMENT	7
Lean Production	8
The Lean Thinking Model	8
The Theory of Constraints	10
Six Sigma	11
THE IMPORTANCE OF ETHICS IN BUSINESS	12
Code of Conduct for Management Accountants	14
Company Codes of Conduct	16
Codes of Conduct on the International Level	17
CORPORATE GOVERNANCE	18
The Sarbanes-Oxley Act of 2002	18
ENTERPRISE RISK MANAGEMENT	19
Identifying and Controlling Business Risks	20
CORPORATE SOCIAL RESPONSIBILITY	21
THE CERTIFIED MANAGEMENT ACCOUNTANT (CMA)	23
Summary	24
Glossary	24

CHAPTER ONE

Managerial Accounting and Cost Concepts 26

Decision Feature: Management Accounting: It's More than Just Crunching Numbers	27
THE WORK OF MANAGEMENT AND THE NEED FOR MANAGERIAL ACCOUNTING INFORMATION	28
Planning	28
Directing and Motivating	29
Controlling	29
The End Results of Managers' Activities	30
The Planning and Control Cycle	30
COMPARISON OF FINANCIAL AND MANAGERIAL ACCOUNTING	30
Emphasis on the Future	31
Relevance of Data	31
Less Emphasis on Precision	32

Segments of an Organization	32
Generally Accepted Accounting Principles (GAAP)	32
Managerial Accounting—Not Mandatory	32
GENERAL COST CLASSIFICATIONS	33
Manufacturing Costs	33
Direct Materials	33
Direct Labor	34
Manufacturing Overhead	34
Nonmanufacturing Costs	35
PRODUCT COSTS VERSUS PERIOD COSTS	35
Product Costs	35
Period Costs	36
Prime Cost and Conversion Cost	36
COST CLASSIFICATIONS ON FINANCIAL STATEMENTS	38
The Balance Sheet	38
The Income Statement	39
Schedule of Cost of Goods Manufactured	41
PRODUCT COST FLOWS	42
Inventoriable Costs	43
An Example of Cost Flows	44
COST CLASSIFICATIONS FOR PREDICTING COST BEHAVIOR	45
Variable Cost	45
Fixed Cost	47
COST CLASSIFICATIONS FOR ASSIGNING COSTS TO COST OBJECTS	49
Direct Cost	49
Indirect Cost	49
COST CLASSIFICATIONS FOR DECISION MAKING	50
Differential Cost and Revenue	50
Opportunity Cost	51
Sunk Cost	52
Summary	52
Guidance Answer to You Decide	54
Guidance Answers to Concept Checks	54
Review Problem 1: Cost Terms	54
Review Problem 2: Schedule of Cost of Goods Manufactured and Income Statement	55
Glossary	57
Questions	58
Brief Exercises	58
Exercises	62
Problems	64
Building Your Skills	70
Research and Application	71

CHAPTER TWO

Systems Design: Job-Order Costing 74

Decision Feature: Two College Students Succeeding as Entrepreneurs	75
PROCESS AND JOB-ORDER COSTING	76
Process Costing	76
Job-Order Costing	77
JOB-ORDER COSTING—AN OVERVIEW	78
Measuring Direct Materials Cost	79
Job Cost Sheet	80
Measuring Direct Labor Cost	80
Applying Manufacturing Overhead	82
Using the Predetermined Overhead Rate	83
The Need for a Predetermined Rate	83
Choice of an Allocation Base for Overhead Cost	84
Computation of Unit Costs	86
Summary of Document Flows	86
JOB-ORDER COSTING—THE FLOW OF COSTS	88
The Purchase and Issue of Materials	88
Issue of Direct and Indirect Materials	88
Labor Cost	89
Manufacturing Overhead Costs	90
Applying Manufacturing Overhead	91
The Concept of a Clearing Account	92
Nonmanufacturing Costs	92
Cost of Goods Manufactured	93
Cost of Goods Sold	94
Summary of Cost Flows	94
PROBLEMS OF OVERHEAD APPLICATION	98
Underapplied and Overapplied Overhead	98
Disposition of Underapplied or Overapplied Overhead Balances	99
A General Model of Product Cost Flows	100
Multiple Predetermined Overhead Rates	102
JOB-ORDER COSTING IN SERVICE COMPANIES	102
Summary	102
Guidance Answers to Decision Maker and You Decide	103
Guidance Answers to Concept Checks	104
Review Problem: Job-Order Costing	104
Glossary	107
Questions	108
Brief Exercises	108
Exercises	110
Problems	114
Building Your Skills	119
Research and Application	122

CHAPTER THREE

Systems Design: Activity-Based Costing 124

Decision Feature: The Payoff from Activity-Based Costing	125
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ASSIGNING OVERHEAD COSTS TO PRODUCTS	126
Plantwide Overhead Rate	126
Departmental Overhead Rates	127
Activity-Based Costing (ABC)	127
DESIGNING AN ACTIVITY-BASED COSTING SYSTEM	129
Hierarchy of Activities	131
An Example of an Activity-Based Costing System Design	132
USING ACTIVITY-BASED COSTING	133
Comtek Sound, Inc.'s Basic Data	134
Direct Labor-Hours as a Base	134
Computing Activity Rates	135
Computing Product Costs	135
Shifting of Overhead Cost	137
TARGETING PROCESS IMPROVEMENTS	138
EVALUATION OF ACTIVITY-BASED COSTING	140
The Benefits of Activity-Based Costing	140
Limitations of Activity-Based Costing	141
The Cost of Implementing Activity-Based Costing	141
Limitations of the ABC Model	141
Modifying the ABC Model	141
Activity-Based Costing and Service Industries	142
COST FLOWS IN AN ACTIVITY-BASED COSTING SYSTEM	143
An Example of Cost Flows	143
Basic Data	143
Tracking the Flow of Costs	144
Summary	146
Guidance Answers to Decision Maker and You Decide	147
Guidance Answers to Concept Checks	147
Review Problem: Activity-Based Costing	147
Glossary	149
Questions	150
Brief Exercises	150
Exercises	153
Problems	155
Building Your Skills	161
Research and Application	165

CHAPTER FOUR

Systems Design: Process Costing 168

Decision Feature: Costing the “Quicker-Picker-Upper”	169
COMPARISON OF JOB-ORDER AND PROCESS COSTING	170
Similarities between Job-Order and Process Costing	170
Differences between Job-Order and Process Costing	170
COST FLOWS IN PROCESS COSTING	171
Processing Departments	171
The Flow of Materials, Labor, and Overhead Costs	172
Materials, Labor, and Overhead Cost Entries	173
Materials Costs	173

Labor Costs	173
Overhead Costs	173
Completing the Cost Flows	174
EQUIVALENT UNITS OF PRODUCTION	176
Weighted-Average Method	176
COMPUTE AND APPLY COSTS	178
Cost per Equivalent Unit—Weighted-Average Method	179
Applying Costs—Weighted-Average Method	180
Cost Reconciliation Report—Weighted-Average Method	180
Summary	181
Guidance Answers to Decision Maker and You Decide	182
Guidance Answers to Concept Checks	182
Review Problem: Process Cost Flows and Costing Units	182
Glossary	185
Questions	185
Brief Exercises	186
Exercises	187
Problems	190
Building Your Skills	194

CHAPTER FIVE

Cost Behavior: Analysis and Use 196

Decision Feature: The Business of Art Sculpture	197
TYPES OF COST BEHAVIOR PATTERNS	198
Variable Costs	198
The Activity Base	199
Extent of Variable Costs	200
True Variable versus Step-Variable Costs	201
True Variable Costs	201
Step-Variable Costs	201
The Linearity Assumption and the Relevant Range	203
Fixed Costs	203
Types of Fixed Costs	205
Committed Fixed Costs	205
Discretionary Fixed Costs	205
The Trend toward Fixed Costs	206
Is Labor a Variable or a Fixed Cost?	207
Fixed Costs and the Relevant Range	208
Mixed Costs	209
THE ANALYSIS OF MIXED COSTS	210
Diagnosing Cost Behavior with a Scattergraph Plot	213
The High-Low Method	217
The Least-Squares Regression Method	220
Multiple Regression Analysis	222
THE CONTRIBUTION FORMAT INCOME STATEMENT	222
Why a New Income Statement Format?	222
The Contribution Approach	222
Summary	223
Guidance Answers to Decision Maker and You Decide	224

Guidance Answers to Concept Checks	225
Review Problem 1: Cost Behavior	225
Review Problem 2: High-Low Method	226
Glossary	227
Questions	227
Brief Exercises	228
Exercises	230
Problems	232
Building Your Skills	236
Research and Application	238
Appendix 5A: Variable Costing	239
Appendix 5A Summary	246
Appendix 5A Review Problem: Contrasting Variable and Absorption Costing	246
Appendix 5A Glossary	248
Appendix 5A Questions	248
Appendix 5A Exercises and Problems	249

CHAPTER SIX

Cost-Volume-Profit Relationships 256

Decision Feature: Forget the Theater—Make Money on Cable TV	257
THE BASICS OF COST-VOLUME-PROFIT (CVP) ANALYSIS	259
Contribution Margin	259
CVP Relationships in Equation Form	261
CVP Relationships in Graphic Form	262
Preparing the CVP Graph	262
Contribution Margin Ratio (CM Ratio)	265
Some Applications of CVP Concepts	267
Change in Fixed Cost and Sales Volume	267
Change in Variable Cost and Sales Volume	268
Change in Fixed Cost, Sales Price, and Sales Volume	269
Change in Variable Cost, Fixed Cost, and Sales Volume	270
Change in Selling Price	271
TARGET PROFIT AND BREAK-EVEN ANALYSIS	271
Target Profit Analysis	271
The Equation Method	271
The Formula Method	271
Target Profit Analysis in Terms of Sales Dollars	272
Break-Even Analysis	273
Break-Even in Unit Sales	273
Break-Even in Sales Dollars	274
The Margin of Safety	275
CVP CONSIDERATIONS IN CHOOSING A COST STRUCTURE	277
Cost Structure and Profit Stability	277
Operating Leverage	279

STRUCTURING SALES COMMISSIONS 281

SALES MIX 282

The Definition of Sales Mix 282

Sales Mix and Break-Even Analysis 283

ASSUMPTIONS OF CVP ANALYSIS 284

Summary 285

Guidance Answers to Decision Maker and You Decide 286

Guidance Answers to Concept Checks 287

Review Problem: CVP Relationships 287

Glossary 290

Questions 290

Brief Exercises 291

Exercises 293

Problems 296

Building Your Skills 302

Research and Application 304

CHAPTER SEVEN

Profit Planning 306

Decision Feature: *Lilo & Stitch* on Budget 307

THE BASIC FRAMEWORK OF BUDGETING 308

Advantages of Budgeting 308

Responsibility Accounting 308

Choosing a Budget Period 309

The Self-Imposed Budget 310

Human Factors in Budgeting 311

The Budget Committee 313

The Master Budget: An Overview 314

PREPARING THE MASTER BUDGET 315

The Sales Budget 317

The Production Budget 318

Inventory Purchases—Merchandising Company 320

The Direct Materials Budget 320

The Direct Labor Budget 322

The Manufacturing Overhead Budget 323

The Ending Finished Goods Inventory Budget 325

The Selling and Administrative Expense Budget 326

The Cash Budget 327

The Budgeted Income Statement 331

The Budgeted Balance Sheet 332

Summary 334

Guidance Answers to Decision Maker and You Decide 335

Guidance Answers to Concept Checks 336

Review Problem: Budget Schedules 336

Glossary 338

Questions 339

Brief Exercises 339

Exercises 343

Problems 345

Building Your Skills 354

Research and Application 357

CHAPTER EIGHT

Flexible Budgets and Performance Analysis 358

Decision Feature: Controlling Costs—Rain or Shine 359

FLEXIBLE BUDGETS 360

Characteristics of a Flexible Budget 360

Deficiencies of the Static Planning Budget 361

How a Flexible Budget Works 363

FLEXIBLE BUDGET VARIANCES 364

Activity Variances 365

Revenue and Spending Variances 366

A Performance Report Combining Activity and Revenue and Spending Variances 368

Performance Reports in Nonprofit Organizations 370

Performance Reports in Cost Centers 370

FLEXIBLE BUDGETS WITH MULTIPLE COST

DRIVERS 371

SOME COMMON ERRORS 373

Summary 374

Guidance Answers to Decision Maker and You Decide 375

Guidance Answers to Concept Checks 375

Review Problem: Variance Analysis Using a Flexible Budget 376

Glossary 377

Questions 378

Brief Exercises 378

Exercises 382

Problems 386

Building Your Skills 391

CHAPTER NINE

Standard Costs 396

Decision Feature: Managing Materials and Labor 397

STANDARD COSTS—MANAGEMENT BY EXCEPTION 399

Who Uses Standard Costs? 401

SETTING STANDARD COSTS 401

Ideal versus Practical Standards 401

Setting Direct Material Standards 403

Setting Direct Labor Standards 403

Setting Variable Manufacturing Overhead Standards 405

A GENERAL MODEL FOR VARIANCE ANALYSIS 405

Price and Quantity Variances 405

USING STANDARD COSTS—DIRECT MATERIALS VARIANCES 406

Materials Price Variance—A Closer Look 409

Isolation of Variances 409

Responsibility for the Variance 409

Materials Quantity Variance—A Closer Look 410

USING STANDARD COSTS—DIRECT LABOR VARIANCES 412

- Labor Rate Variance—A Closer Look 412
- Labor Efficiency Variance—A Closer Look 413

USING STANDARD COSTS—VARIABLE MANUFACTURING OVERHEAD VARIANCES 414

- Manufacturing Overhead Variances—A Closer Look 415

VARIANCE ANALYSIS AND MANAGEMENT BY EXCEPTION 417

EVALUATION OF CONTROLS BASED ON STANDARD COSTS 419

- Advantages of Standard Costs 419
- Potential Problems with the Use of Standard Costs 419
- Summary 420
- Guidance Answers to Decision Maker and You Decide 421
- Guidance Answers to Concept Checks 421
- Review Problem: Standard Costs 421
- Glossary 423
- Questions 424
- Brief Exercises 424
- Exercises 425
- Problems 427
- Building Your Skills 432
- Appendix 9A: Predetermined Overhead Rates and Overhead Analysis in a Standard Costing System 434
- Appendix 9A Summary 440
- Appendix 9A Glossary 440
- Appendix 9A Exercises and Problems 440
- Appendix 9B Journal Entries to Record Variances 445
- Appendix 9B Summary 447
- Appendix 9B Exercises and Problems 447

CHAPTER TEN

Segment Reporting, Decentralization, and the Balanced Scorecard 452

- Decision Feature: Sony Attempts to Rebound 453

DECENTRALIZATION IN ORGANIZATIONS 454

- Advantages and Disadvantages of Decentralization 454

RESPONSIBILITY ACCOUNTING 455

- Cost, Profit, and Investment Centers 455

- Cost Center 455

- Profit Center 456

- Investment Center 456

- An Organizational View of Responsibility Centers 456

DECENTRALIZATION AND SEGMENT REPORTING 457

- Building a Segmented Income Statement 459
- Levels of Segmented Statements 461
- Sales and Contribution Margin 463
- Traceable and Common Fixed Costs 463
 - Identifying Traceable Fixed Costs 463
 - Activity-Based Costing 464

- Traceable Costs Can Become Common Costs 465

- Segment Margin 465

- Segmented Financial Information in External Reports 467

HINDRANCES TO PROPER COST ASSIGNMENT 468

- Omission of Costs 468
- Inappropriate Methods for Assigning Traceable Costs among Segments 468
 - Failure to Trace Costs Directly 468
 - Inappropriate Allocation Base 468
- Arbitrarily Dividing Common Costs among Segments 469

EVALUATING INVESTMENT CENTER

PERFORMANCE—RETURN ON INVESTMENT 470

- The Return on Investment (ROI) Formula 470
- Net Operating Income and Operating Assets Defined 471
- Understanding ROI 471
- Criticisms of ROI 474

RESIDUAL INCOME 475

- Motivation and Residual Income 477
- Divisional Comparison and Residual Income 478

BALANCED SCORECARD 479

- Common Characteristics of Balanced Scorecards 480
- A Company's Strategy and the Balanced Scorecard 482
- Tying Compensation to the Balanced Scorecard 484
- Advantages of Timely and Graphic Feedback 485

- Summary 486

- Guidance Answers to Decision Maker and You Decide 486

- Guidance Answers to Concept Checks 487

- Review Problem 1: Segmented Statements 488

- Review Problem 2: Return on Investment (ROI) and Residual Income 489

- Glossary 490

- Questions 490

- Brief Exercises 491

- Exercises 492

- Problems 497

- Building Your Skills 504

- Research and Application 506

CHAPTER ELEVEN

Relevant Costs for Decision Making 508

- Decision Feature: Massaging the Numbers 509

COST CONCEPTS FOR DECISION MAKING 510

- Identifying Relevant Costs and Benefits 510
- Different Costs for Different Purposes 511
- An Example of Identifying Relevant Costs and Benefits 512
- Reconciling the Total and Differential Approaches 514
- Why Isolate Relevant Costs? 516

ADDING AND DROPPING PRODUCT LINES AND OTHER SEGMENTS	518	Summary	530
An Illustration of Cost Analysis	518	Guidance Answer to Decision Maker	531
A Comparative Format	520	Guidance Answers to Concept Checks	531
Beware of Allocated Fixed Costs	520	Review Problem: Relevant Costs	532
THE MAKE OR BUY DECISION	521	Glossary	533
An Example of Make or Buy	522	Questions	533
OPPORTUNITY COST	524	Brief Exercises	534
SPECIAL ORDERS	525	Exercises	537
UTILIZATION OF A CONSTRAINED RESOURCE	526	Problems	541
Contribution Margin per Unit of the Constrained Resource	527	Building Your Skills	548
Managing Constraints	528	Credits	686
		Index	687

Managerial Accounting and the Business Environment

<< A LOOK AT THE PROLOGUE

Today's managers know that their world is constantly changing and becoming more complex. Before we get down to the basics, this Prologue will introduce you to a few of the revolutionary changes that today's managers face.

A LOOK AHEAD >>

Chapter 1 describes the work performed by managers, stresses the need for managerial accounting information, contrasts managerial and financial accounting, and defines many of the cost terms that will be used throughout the textbook. You will begin to build your base there.

PROLOGUE OUTLINE

Globalization

Strategy

Organizational Structure

- Decentralization
- The Functional View of Organizations

Process Management

- Lean Production
- The Theory of Constraints (TOC)
- Six Sigma

The Importance of Ethics in Business

- Code of Conduct for Management Accountants
- Company Codes of Conduct
- Codes of Conduct on the International Level

Corporate Governance

- The Sarbanes-Oxley Act of 2002

Enterprise Risk Management

- Identifying and Controlling Business Risks

Corporate Social Responsibility

The Certified Management Accountant (CMA)

Throughout this book you will study how management accounting functions within organizations. However, before embarking on the study of management accounting, you need to develop an appreciation for the larger business environment within which it operates. The Prologue is divided into nine sections: (1) globalization, (2) strategy, (3) organizational structure, (4) process management, (5) the importance of ethics in business, (6) corporate governance, (7) enterprise risk management, (8) corporate social responsibility, and (9) the Certified Management Accountant (CMA). Other business classes provide greater detail on many of these topics. Nonetheless, a broad discussion of these topics is useful for placing management accounting in its proper context.

GLOBALIZATION

The world has become much more intertwined over the last 20 years. Reductions in tariffs, quotas, and other barriers to free trade; improvements in global transportation systems; explosive expansion in Internet usage; and increasing sophistication in international markets have created a truly global marketplace. Exhibit P-1 illustrates this tremendous growth in international trade from the standpoint of the United States and some of its key trading partners. Panel A of the exhibit shows the dollar value of imports (stated in billions of dollars) into the United States from six countries; Panel B shows the dollar value of exports from the United States to those same six countries. As you can see, the increase in import and export activity from 1995 to 2007 was huge. In particular, trade with China expanded enormously as did trade with Mexico and Canada, which participate in the North American Free Trade Agreement (NAFTA).

In a global marketplace, a company that has been very successful in its local market may suddenly find itself facing competition from halfway around the globe. For example, in the 1980s American automobile manufacturers began losing market share to Japanese competitors who offered American consumers higher quality cars at lower prices. For consumers, heightened international competition promises a greater variety of goods and services, at higher quality and lower prices. However, heightened international competition threatens companies that may have been quite profitable in their own local markets.

Although globalization leads to greater competition, it also means greater access to new markets, customers, and workers. For example, the emerging markets of China, India, Russia, and Brazil contain more than 2.5 billion potential customers and workers.¹ Many companies such as **FedEx**, **McDonald's**, and **Nike** are actively seeking to grow their sales by investing in emerging markets. In addition, the movement of jobs from the United States and Western Europe to other parts of the world has been notable in recent years. For example, one study estimates that by the end of the decade more than 825,000 financial services and high-tech jobs will transfer from Western Europe to less expensive labor markets such as India, China, Africa, Eastern Europe, and Latin America.²

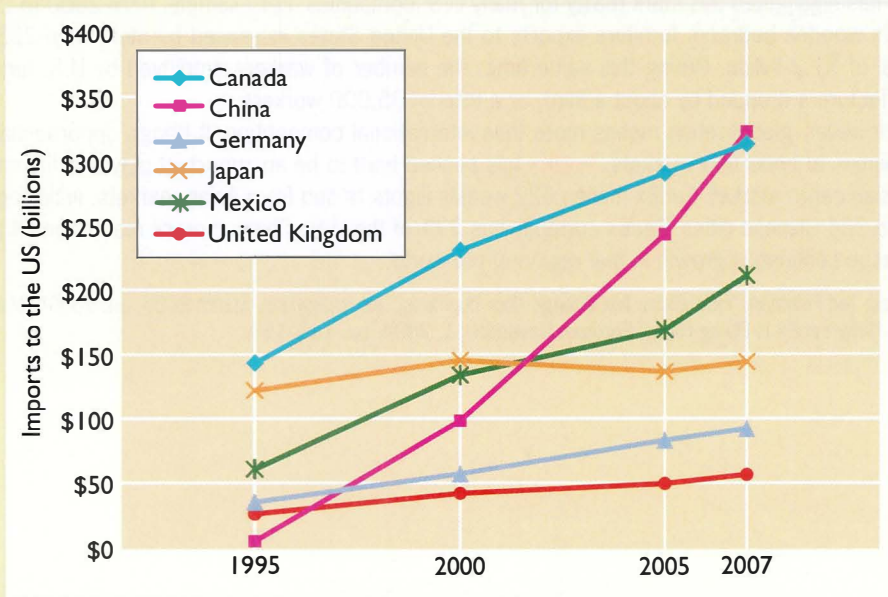
The Internet fuels globalization by providing companies with greater access to geographically dispersed customers, employees, and suppliers. While the number of Internet users continues to grow, as of 2008, more than 78% of the world's population was still not connected to the Internet. This suggests that the Internet's impact on global business has yet to fully develop.

¹*The Economist: Pocket World in Figures 2004*, Profile Books Ltd., London, U.K.

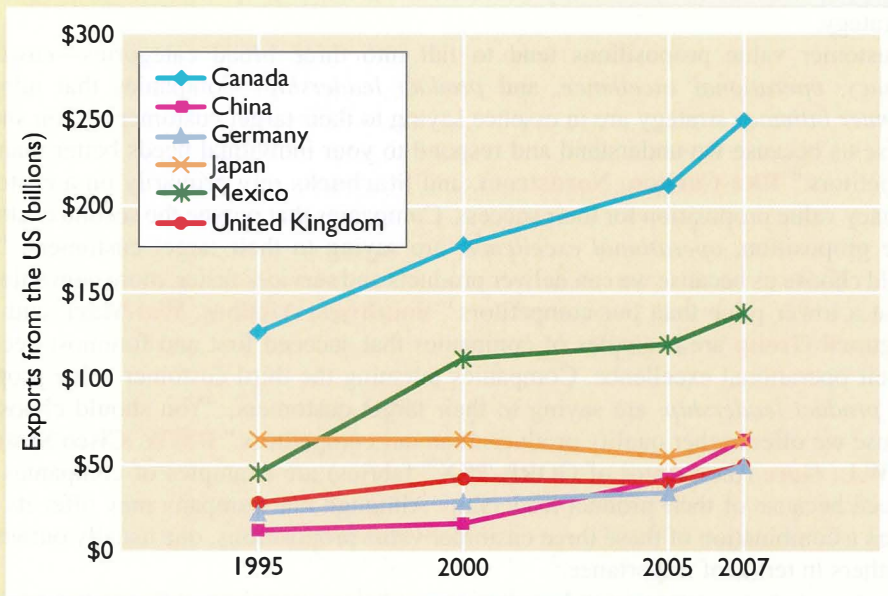
²"Job Exports: Europe's Turn," *BusinessWeek*, April 19, 2004, p. 50.

EXHIBIT P-1 United States Global Trade Activity (in billions of U.S. dollars)

Panel A: Imports to the United States (billions of dollars)



Panel B: Exports from the United States (billions of dollars)



Source: U.S. Census Bureau, Foreign Trade Division, Data Dissemination Branch, Washington, D.C. 20233. www.census.gov/foreign-trade/balance.

IN BUSINESS

The Implications of Globalization

International competition goes hand-in-hand with globalization. China's entrance into the global marketplace has highlighted this stark reality for many U.S. companies. For example, from 2000 to 2003, China's wooden bedroom furniture exports to the United States increased by more than 233% to a total of \$1.2 billion. During this same time, the number of workers employed by U.S. furniture manufacturers dropped by about a third, or a total of 35,000 workers.

However, globalization means more than international competition. It brings opportunities for companies to enter new markets. **FedEx** has pushed hard to be an important player in the emerging Asian cargo market. FedEx makes 622 weekly flights to and from Asian markets, including service to 224 Chinese cities. FedEx currently has 39% of the U.S.–China express market and it plans to pursue continuous growth in that region of the world.

Sources: Ted Fishman, "How China Will Change Your Business," *Inc.* magazine, March 2005, pp. 70–84; Matthew Boyle, "Why FedEx Is Flying High," *Fortune*, November 1, 2004, pp. 145–150.



STRATEGY

Even more than in the past, companies that now face global competition must have a viable *strategy* for succeeding in the marketplace. A **strategy** is a "game plan" that enables a company to attract customers by distinguishing itself from competitors. The focal point of a company's strategy should be its target customers. A company can only succeed if it creates a reason for customers to choose it over a competitor. These reasons, or what are more formally called *customer value propositions*, are the essence of strategy.

Customer value propositions tend to fall into three broad categories—*customer intimacy*, *operational excellence*, and *product leadership*. Companies that adopt a *customer intimacy* strategy are in essence saying to their target customers, "You should choose us because we understand and respond to your individual needs better than our competitors." **Ritz-Carlton**, **Nordstrom**, and **Starbucks** rely primarily on a customer intimacy value proposition for their success. Companies that pursue the second customer value proposition, *operational excellence*, are saying to their target customers, "You should choose us because we can deliver products and services faster, more conveniently, and at a lower price than our competitors." **Southwest Airlines**, **Wal-Mart**, and **The Vanguard Group** are examples of companies that succeed first and foremost because of their operational excellence. Companies pursuing the third customer value proposition, *product leadership*, are saying to their target customers, "You should choose us because we offer higher quality products than our competitors." **BMW**, **Cisco Systems**, and **W.L. Gore** (the creator of GORE-TEX® fabrics) are examples of companies that succeed because of their product leadership. Although one company may offer its customers a combination of these three customer value propositions, one usually outweighs the others in terms of importance.³

Next we turn our attention to how businesses create organizational structures to help accomplish their strategic goals.

³These three customer value propositions were defined by Michael Treacy and Fred Wiersema in "Customer Intimacy and Other Value Disciplines," *Harvard Business Review* 71, no. 1, pp. 84–93.

Operational Excellence Comes to the Diamond Business

IN BUSINESS

An average engagement ring purchased from **Blue Nile**, an Internet diamond retailer, costs \$5,200 compared to \$9,500 if purchased from **Tiffany & Co.**, a bricks-and-mortar retailer. Why is there such a difference? There are three reasons. First, Blue Nile allows wholesalers to sell directly to customers using its website. In the brick-and-mortar scenario, diamonds change hands as many as seven times before being sold to a customer—passing through various cutters, wholesalers, brokers, and retailers, each of whom demands a profit. Second, Blue Nile carries very little inventory and incurs negligible overhead. Diamonds are shipped directly from wholesalers after they have been purchased by a customer—no retail outlets are necessary. Bricks-and-mortar retailers tie up large amounts of money paying for the inventory and employees on their showroom floors. Third, Blue Nile generates a high volume of transactions by selling to customers anywhere in the world; therefore, it can accept a lower profit margin per transaction than local retailers, who complete fewer transactions with customers within a limited geographic radius.

Perhaps you are wondering why customers are willing to trust an Internet retailer when buying an expensive item such as a diamond. The answer is that all of the diamonds sold through Blue Nile's website are independently certified by the Gemological Institute of America in four categories—carat count, type of cut, color, and clarity. In essence, Blue Nile has turned diamonds into a commodity and is using an operational excellence customer value proposition to generate annual sales of \$154 million.

Source: Victoria Murphy, "Romance Killer," *Forbes*, November 29, 2004, pp. 97–101.



ORGANIZATIONAL STRUCTURE

Our discussion of organizational structure is divided into two parts. First, we highlight the fact that presidents of all but the smallest companies cannot execute their strategies alone. They must seek the help of their employees by empowering them to make decisions—they must *decentralize*. Next, we describe the most common formal decentralized organizational structure in use today—the functional structure.

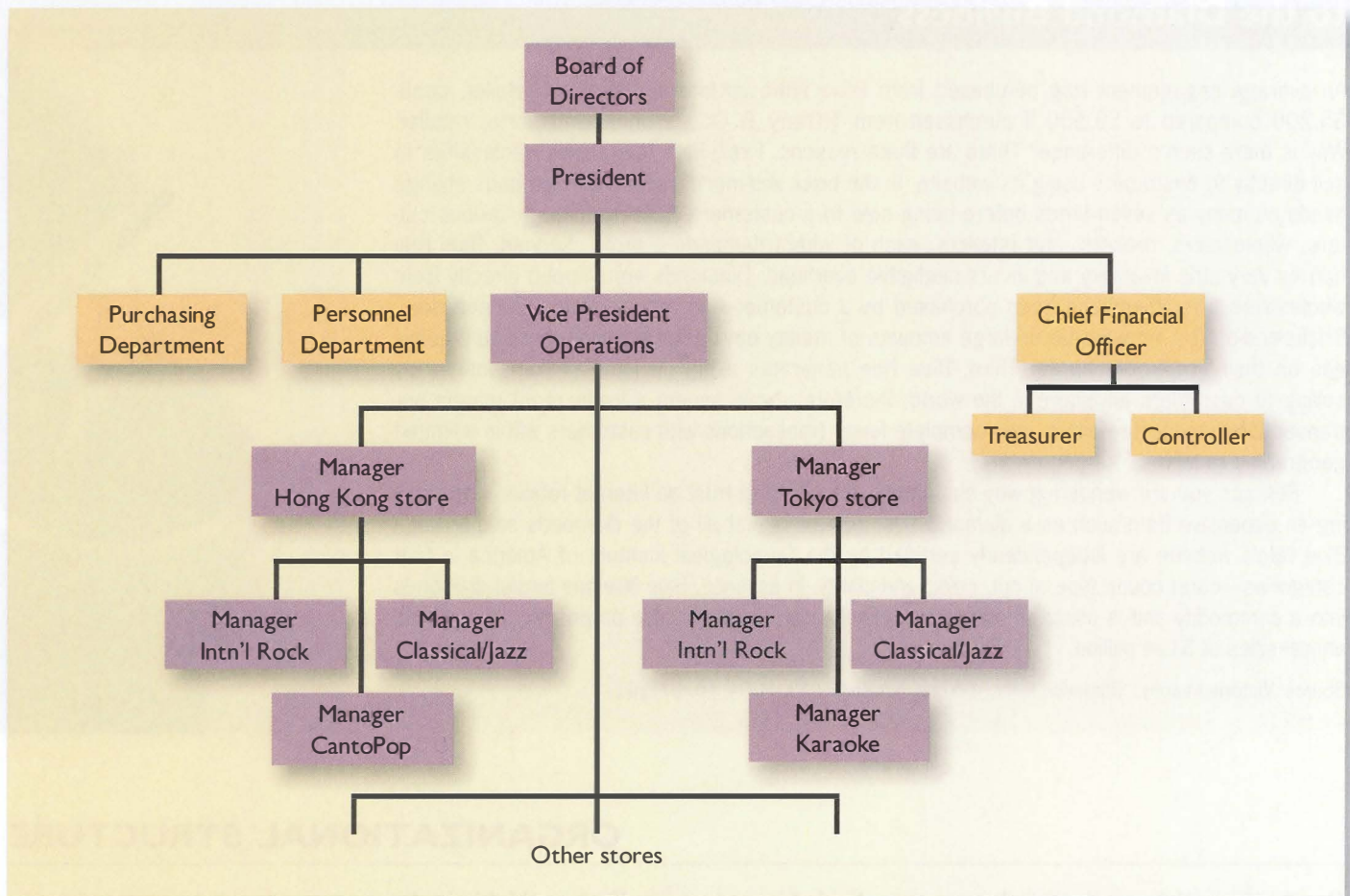
Decentralization

Decentralization is the delegation of decision-making authority throughout an organization by giving managers the authority to make decisions relating to their area of responsibility. Some organizations are more decentralized than others. For example, consider Good Vibrations, an international retailer of music CDs with shops in major cities scattered across the Pacific Rim. Because of Good Vibrations' geographic dispersion and the peculiarities of local markets, the company is highly decentralized.

Good Vibrations' president (often synonymous with the term *chief executive officer*, or *CEO*) sets the broad strategy for the company and makes major strategic decisions such as opening stores in new markets; however, much of the remaining decision-making authority is delegated to managers at various levels throughout the organization. Each of the company's numerous retail stores has a store manager as well as a separate manager for each music category such as international rock and classical/jazz. In addition, the company has support departments such as a central Purchasing Department and a Personnel Department.

The Functional View of Organizations

Exhibit P-2 shows Good Vibrations' organizational structure in the form of an **organization chart**. The purpose of an organization chart is to show how responsibility is

EXHIBIT P-2 Organization Chart, Good Vibrations, Inc.

divided among managers and to show formal lines of reporting and communication, or *chain of command*. Each box depicts an area of management responsibility, and the lines between the boxes show the lines of formal authority between managers. The chart tells us, for example, that the store managers are responsible to the operations vice president. In turn, the operations vice president is responsible to the company president, who in turn is responsible to the board of directors. Following the lines of authority and communication on the organization chart, we can see that the manager of the Hong Kong store would ordinarily report to the operations vice president rather than directly to the president of the company.

An organization chart also depicts *line* and *staff* positions in an organization. A person in a **line** position is *directly* involved in achieving the basic objectives of the organization. A person in a **staff** position, by contrast, is only *indirectly* involved in achieving those basic objectives. Staff positions provide assistance to line positions or other parts of the organization, but they do not have direct authority over line positions. Refer again to the organization chart in Exhibit P-2. Because the basic objective of Good Vibrations is to sell recorded music at a profit, those managers whose areas of responsibility are directly related to selling music occupy line positions. These positions, which are shown in a darker color in the exhibit, include the managers of the various music departments in each store, the store managers, the operations vice president, the president, and the board of directors.

By contrast, the managers of the central Purchasing Department and the Personnel Department occupy staff positions, because their departments support other departments rather than carry out the company's basic missions. The chief financial officer is a member of the top management team who also occupies a staff position. The **chief financial officer (CFO)** is responsible for providing timely and relevant data to support planning

and control activities and for preparing financial statements for external users. In the United States, a manager known as the **controller** often runs the accounting department and reports directly to the CFO. More than ever, the accountants who work under the CFO are focusing their efforts on supporting the needs of co-workers in line positions as one report concluded:

Growing numbers of management accountants spend the bulk of their time as internal consultants or business analysts within their companies. Technological advances have liberated them from the mechanical aspects of accounting. They spend less time preparing standardized reports and more time analyzing and interpreting information. Many have moved from the isolation of accounting departments to be physically positioned in the operating departments with which they work. Management accountants work on cross-functional teams, have extensive face-to-face communications with people throughout their organizations, and are actively involved in decision making. . . . They are trusted advisors.⁴

What Does it Take?

IN BUSINESS



A controller at **McDonald's** describes the characteristics needed by its most successful management accountants as follows:

It's a given that you know your accounting cold. You're expected to know the tax implications of proposed courses of action. You need to understand cost flows and information flows. You have to be very comfortable with technology and be an expert in the company's business and accounting software. You have to be a generalist. You need a working knowledge of what people do in marketing, engineering, human resources, and other departments. You need to understand how the processes, departments, and functions work together to run the business. You'll be expected to contribute ideas at planning meetings, so you have to see the big picture, keep a focus on the bottom line, and think strategically.

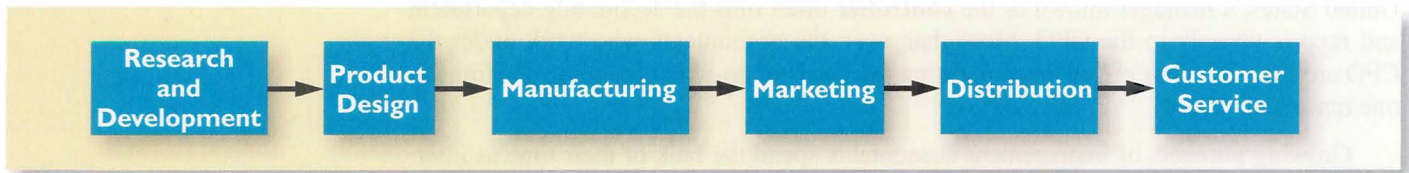
Source: Gary Siegel, James E. Sorensen, and Sandra B. Richtermeyer, "Becoming a Business Partner: Part 2," *Strategic Finance*, October 2003, pp. 37–41. Used with permission from the Institute of Management Accountants (IMA), Montvale, NJ, USA, www.imanet.org.

PROCESS MANAGEMENT

As global competition intensifies, companies are realizing that they must complement the functional view of their operations with a cross-functional orientation that seeks to improve the *business processes* that deliver customer value. A **business process** is a series of steps that are followed in order to carry out some task in a business. It is quite common for the linked set of steps comprising a business process to span departmental boundaries. The term *value chain* is often used when we look at how the functional departments of an organization interact with one another to form business processes. A **value chain**, as shown in Exhibit P-3, consists of the major business functions that add value to a company's products and services. The customer's needs are most effectively met by coordinating the business processes that span these functions.

This section discusses three different approaches to managing and improving business processes—Lean Production, the Theory of Constraints (TOC), and Six Sigma. Although each is unique in certain respects, they all share the common theme of focusing on managing and improving business processes.

⁴Gary Siegel Organization, *Counting More, Counting Less: Transformations in the Management Accounting Profession, The 1999 Practice Analysis of Management Accounting*, Institute of Management Accountants, Montvale, NJ, August 1999, p. 3.

EXHIBIT P-3 Business Functions Making Up the Value Chain

Lean Production

Traditionally, managers in manufacturing companies have sought to maximize production so as to spread the costs of investments in equipment and other assets over as many units as possible. In addition, managers have traditionally felt that an important part of their jobs was to keep everyone busy on the theory that idleness wastes money. These traditional views, often aided and abetted by traditional management accounting practices, resulted in a number of practices that have come under criticism in recent years.

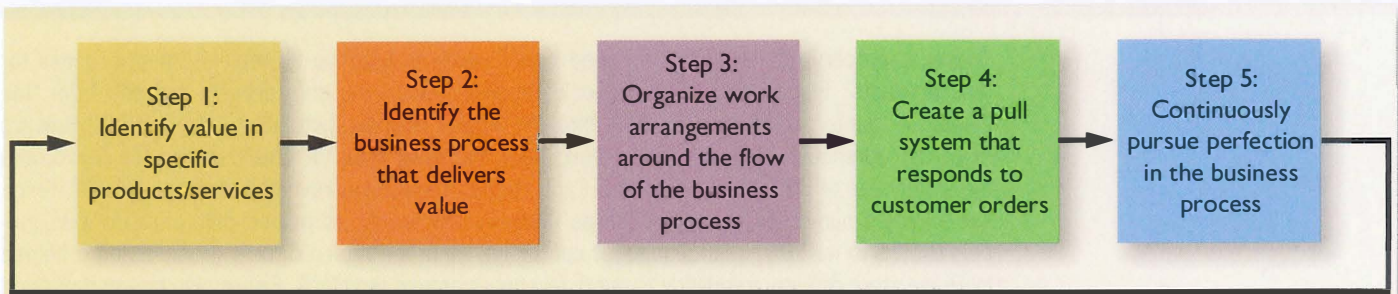
In a traditional manufacturing company, work is *pushed* through the system in order to produce as much as possible and to keep everyone busy—even if products cannot be immediately sold. This almost inevitably results in large inventories of *raw materials*, *work in process*, and *finished goods*. **Raw materials** are the materials that are used to make a product. **Work in process** inventories consist of units of product that are only partially complete and will require further work before they are ready for sale to a customer. **Finished goods** inventories consist of units of product that have been completed but have not yet been sold to customers.

The *push* process in traditional manufacturing starts by accumulating large amounts of raw material inventories from suppliers so that operations can proceed smoothly even if unanticipated disruptions occur. Next, enough materials are released to workstations to keep everyone busy. When a workstation completes its tasks, the partially completed goods (i.e., work in process) are “pushed” forward to the next workstation regardless of whether that workstation is ready to receive them. The result is that partially completed goods stack up, waiting for the next workstation to become available. They may not be completed for days, weeks, or even months. Additionally, when the units are finally completed, customers may or may not want them. If finished goods are produced faster than the market will absorb, the result is bloated finished goods inventories.

Although some may argue that maintaining large amounts of inventory has its benefits, it clearly has its costs. In addition to tying up money, maintaining inventories encourages inefficient and sloppy work, results in too many defects, and dramatically increases the amount of time required to complete a product. For example, when partially completed goods are stored for long periods of time before being processed by the next workstation, defects introduced by the preceding workstation go unnoticed. If a machine is out of calibration or incorrect procedures are being followed, many defective units will be produced before the problem is discovered. And when the defects are finally discovered, it may be very difficult to track down the source of the problem. In addition, units may be obsolete or out of fashion by the time they are finally completed.

Large inventories of partially completed goods create many other problems that are best discussed in more advanced courses. These problems are not obvious—if they were, companies would have long ago reduced their inventories. Managers at **Toyota** are credited with the insight that large inventories often create many more problems than they solve. Toyota pioneered what is known today as *Lean Production*.

The Lean Thinking Model The **lean thinking model** is a five-step management approach that organizes resources such as people and machines around the flow of business processes and that pulls units through these processes in response to customer orders. The result is lower inventories, fewer defects, less wasted effort, and quicker customer response times. Exhibit P-4 depicts the five stages of the lean thinking model.

EXHIBIT P-4 The Lean Thinking Model

Source: This exhibit is adapted from James P. Womack and Daniel T. Jones, *Lean Thinking: Banish Waste and Create Wealth in Your Corporation, Revised and Updated*, Simon & Schuster, New York, NY, 2003.

The first step is to identify the value to customers in specific products and services. The second step is to identify the *business process* that delivers this value to customers.⁵ As discussed earlier, the linked set of steps comprising a business process typically span the departmental boundaries that are specified in an organization chart. The third step is to organize work arrangements around the flow of the business process. This is often accomplished by creating what is known as a *manufacturing cell*. The cellular approach takes employees and equipment from departments that were previously separated from one another and places them side-by-side in a work space called a *cell*. The equipment within the cell is aligned in a sequential manner that follows the steps of the business process. Each employee is trained to perform all the steps within his or her own manufacturing cell.

The fourth step in the lean thinking model is to create a pull system where production is not initiated until a customer has ordered a product. Inventories are reduced to a minimum by purchasing raw materials and producing units only as needed to meet customer demand. Under ideal conditions, a company operating a pull system would purchase only enough materials each day to meet that day's needs. Moreover, the company would have no goods still in process at the end of the day, and all goods completed during the day would be shipped immediately to customers. As this sequence suggests, work takes place "just-in-time" in the sense that raw materials are received by each manufacturing cell just in time to go into production, manufactured parts are completed just in time to be assembled into products, and products are completed just in time to be shipped to customers. This facet of the lean thinking model is often called **just-in-time** production, or **JIT** for short.

The change from *push* to *pull* production is more profound than it may appear. Among other things, producing only in response to a customer order means that workers will be idle whenever demand falls below the company's production capacity. This can be an extremely difficult cultural change for an organization. It challenges the core beliefs of many managers and raises anxieties in workers who have become accustomed to being kept busy all of the time.

The fifth step of the lean thinking model is to continuously pursue perfection in the business process. In a traditional company, parts and materials are inspected for defects when they are received from suppliers, and assembled units are inspected as they progress along the production line. In a Lean Production system, the company's suppliers are responsible for the quality of incoming parts and materials. And instead of using quality inspectors, the company's production workers are directly responsible for spotting defective units. A worker who discovers a defect immediately stops the flow of production. Supervisors and other workers go to the cell to determine the cause of the problem and correct it before any further defective units are produced. This procedure ensures that problems are quickly identified and corrected.

⁵The Lean Production literature uses the term *value stream* rather than *business process*.

IN BUSINESS

Lean Supply Chain Management

Tesco, a grocery retailer in Britain, used lean thinking to improve its replenishment process for cola products. Tesco and **Britvic** (its cola supplier) traced the cola delivery process from “the checkout counter of the grocery store through Tesco’s regional distribution center (RDC), Britvic’s RDC, the warehouse at the Britvic bottling plant, the filling lines for cola destined for Tesco, and the warehouse of Britvic’s can supplier.” Each step of the process revealed enormous waste. Tesco implemented numerous changes such as electronically linking its point-of-sale data from its grocery stores to its RDC. This change let customers pace the replenishment process and it helped increase store delivery frequency to every few hours around the clock. Britvic also began delivering cola to Tesco’s RDC in wheeled dollies that could be rolled directly into delivery trucks and then to point-of-sale locations in grocery stores.

These changes reduced the total product “touches” from 150 to 50, thereby cutting labor costs. The elapsed time from the supplier’s filling line to the customer’s cola purchase dropped from 20 days to 5 days. The number of inventory stocking locations declined from five to two, and the supplier’s distribution center was eliminated.

Source: Ghostwriter, “Teaching the Big Box New Tricks,” *Fortune*, November 14, 2005, pp. 208B–208F.

The lean thinking model can also be used to improve the business processes that link companies together. The term **supply chain management** is commonly used to refer to the coordination of business processes across companies to better serve end consumers. For example **Procter & Gamble** and **Costco** coordinate their business processes to ensure that Procter & Gamble’s products, such as Bounty, Tide, and Crest, are on Costco’s shelves when customers want them. Both Procter & Gamble and Costco realize that their mutual success depends on working together to ensure Procter & Gamble’s products are available to Costco’s customers.



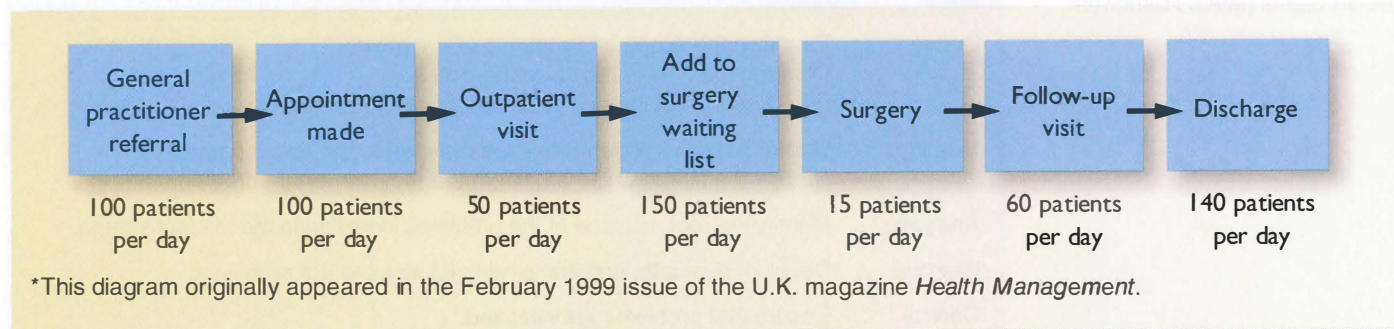
The Theory of Constraints (TOC)

A **constraint** is anything that prevents you from getting more of what you want. Every individual and every organization faces at least one constraint, so it is not difficult to find examples of constraints. You may not have enough time to study thoroughly for every subject *and* to go out with your friends on the weekend, so time is your constraint. **United Airlines** has only a limited number of loading gates available at its busy Chicago O’Hare hub, so its constraint is loading gates. **Vail Resorts** has only a limited amount of land to develop as homesites and commercial lots at its ski areas, so its constraint is land.

The **Theory of Constraints (TOC)** is based on the insight that effectively managing the constraint is a key to success. As an example, long waiting periods for surgery are a chronic problem in the **National Health Service (NHS)**, the government-funded provider of health care in the United Kingdom. The diagram in Exhibit P-5 illustrates a simplified version of the steps followed by a surgery patient. The number of patients who can be processed through each step in a day is indicated in the exhibit. For example, appointments for outpatient visits can be made for as many as 100 referrals from general practitioners in a day.

The constraint, or *bottleneck*, in the system is determined by the step that has the smallest capacity—in this case surgery. The total number of patients processed through the entire system cannot exceed 15 per day—the maximum number of patients who can be treated in surgery. No matter how hard managers, doctors, and nurses try to improve the processing rate elsewhere in the system, they will never succeed in driving down wait lists until the capacity of surgery is increased. In fact, improvements elsewhere in the system—particularly before the constraint—are likely to result in even longer waiting times and more frustrated patients and health care providers. Thus, to be effective, improvement efforts must be focused on the constraint. A business process, such as the

EXHIBIT P-5 Processing Surgery Patients at an NHS Facility (simplified)*



process for serving surgery patients, is like a chain. If you want to increase the strength of a chain, what is the most effective way to do this? Should you concentrate your efforts on strengthening the strongest link, all the links, or the weakest link? Clearly, focusing your effort on the weakest link will bring the biggest benefit.

The procedure to follow to strengthen the chain is clear. First, identify the weakest link, which is the constraint. In the case of the NHS, the constraint is surgery. Second, do not place a greater strain on the system than the weakest link can handle—if you do, the chain will break. In the case of the NHS, more referrals than surgery can accommodate lead to unacceptably long waiting lists. Third, concentrate improvement efforts on strengthening the weakest link. In the case of the NHS, this means finding ways to increase the number of surgeries that can be performed in a day. Fourth, if the improvement efforts are successful, eventually the weakest link will improve to the point where it is no longer the weakest link. At that point, the new weakest link (i.e., the new constraint) must be identified, and improvement efforts must be shifted over to that link. This simple sequential process provides a powerful strategy for optimizing business processes.

Watch Where You Cut Costs

At one hospital, the emergency room became so backlogged that its doors were closed to the public and patients were turned away for over 36 hours in the course of a single month. It turned out, after investigation, that the constraint was not the emergency room itself; it was the housekeeping staff. To cut costs, managers at the hospital had laid off housekeeping workers. This created a bottleneck in the emergency room because rooms were not being cleaned as quickly as the emergency room staff could process new patients. Thus, laying off some of the lowest paid workers at the hospital had the effect of forcing the hospital to idle some of its most highly paid staff and most expensive equipment!

Source: Tracey Burton-Houle, "AGI Continues to Steadily Make Advances with the Adaptation of TOC into Healthcare," www.goldratt.com/toctquarterly/august2002.htm.

IN BUSINESS



Six Sigma

Six Sigma is a process improvement method that relies on customer feedback and fact-based data gathering and analysis techniques to drive process improvement. **Motorola** and **General Electric** are closely identified with the Six Sigma movement. Technically, the term Six Sigma refers to a process that generates no more than 3.4 defects per million opportunities. Because this rate of defects is so low, Six Sigma is sometimes associated with the term *zero defects*.

The most common framework used to guide Six Sigma process improvement efforts is known as DMAIC (pronounced: du-may-ik), which stands for Define, Measure, Analyze,

EXHIBIT P-6

The Six Sigma DMAIC Framework

Stage	Goals
Define	Establish the scope and purpose of the project. Diagram the flow of the current process. Establish the customer's requirements for the process.
Measure	Gather baseline performance data related to the existing process. Narrow the scope of the project to the most important problems.
Analyze	Identify the root cause(s) of the problems identified in the Measure stage.
Improve	Develop, evaluate, and implement solutions to the problems.
Control	Ensure that problems remain fixed. Seek to improve the new methods over time.

Source: Peter C. Brewer and Nancy A. Bagranoff, "Near Zero-Defect Accounting with Six Sigma," *Journal of Corporate Accounting and Finance*, January–February 2004, pp. 67–72.

Improve, and Control. As summarized in Exhibit P-6, the Define stage of the process focuses on defining the scope and purpose of the project, the flow of the current process, and the customer's requirements. The Measure stage is used to gather baseline performance data concerning the existing process and to narrow the scope of the project to the most important problems. The Analyze stage focuses on identifying the root causes of the problems that were identified during the Measure stage. The Analyze stage often reveals that the process includes many *activities that do not add value to the product or service*. Activities that customers are not willing to pay for because they add no value are known as **non-value-added activities** and such activities should be eliminated wherever possible. During the Improve stage potential solutions are developed, evaluated, and implemented to eliminate non-value-added activities and any other problems uncovered in the Analyze stage. Finally, the objective in the Control stage is to ensure that the problems remain fixed and that the new methods are improved over time.

Managers must be very careful when attempting to translate Six Sigma improvements into financial benefits. There are only two ways to increase profits—decrease costs or increase sales. Cutting costs may seem easy—lay off workers who are no longer needed because of improvements such as eliminating non-value-added activities. However, if this approach is taken, employees quickly get the message that process improvements lead to job losses and they will understandably resist further improvement efforts. If improvement is to continue, employees must be convinced that the end result of improvement will be more secure rather than less secure jobs. This can only happen if management uses tools such as Six Sigma to increase sales rather than to cut the workforce.

THE IMPORTANCE OF ETHICS IN BUSINESS

A series of major financial scandals involving **Enron**, **Tyco International**, **HealthSouth**, **Adelphia Communications**, **WorldCom**, **Global Crossing**, **Rite Aid**, and other companies have raised deep concerns about ethics in business. The managers and companies involved in these scandals have suffered mightily—from huge fines to jail terms and financial collapse. And the recognition that ethical behavior is absolutely essential for the functioning of our economy has led to numerous regulatory changes—some of which we will discuss in a later section on corporate governance. But why is ethical behavior so important? This is not a matter of just being "nice." Ethical behavior is the lubricant that keeps the economy running. Without that lubricant, the economy would operate much less efficiently—less would be available to consumers, quality would be lower, and prices would be higher.

Take a very simple example. Suppose that dishonest farmers, distributors, and grocers knowingly tried to sell wormy apples as good apples and that grocers refused to take back wormy apples. What would you do as a consumer of apples? Go to another grocer? But what if all grocers acted this way? What would you do then? You would probably either stop buying apples or you would spend a lot of time inspecting apples before buying them. So would everyone else. Now notice what has happened. Because farmers, distributors, and grocers could not be trusted, sales of apples would plummet and those who did buy apples would waste a lot of time inspecting them minutely. Everyone loses. Farmers, distributors, and grocers make less money; consumers enjoy fewer apples; and consumers waste time looking for worms. In other words, without fundamental trust in the integrity of businesses, the economy would operate much less efficiently. James Surowiecki summed up this point as follows:

[F]lourishing economies require a healthy level of trust in the reliability and fairness of everyday transactions. If you assumed every potential deal was a rip-off or that the products you were buying were probably going to be lemons, then very little business would get done. More important, the costs of the transactions that did take place would be exorbitant because you'd have to do enormous work to investigate each deal and you'd have to rely on the threat of legal action to enforce every contract. For an economy to prosper, what's needed is not a Pollyannaish faith that everyone else has your best interests at heart—"caveat emptor" [buyer beware] remains an important truth—but a basic confidence in the promises and commitments that people make about their products and services.⁶

No Trust—No Enron

IN BUSINESS

Jonathan Karpoff reports on a particularly important, but often overlooked, aspect of the **Enron** debacle:

As we know, some of Enron's reported profits in the late 1990s were pure accounting fiction. But the firm also had legitimate businesses and actual assets. Enron's most important businesses involved buying and selling electricity and other forms of energy. [Using Enron as an intermediary, utilities that needed power bought energy from producers with surplus generating capacity.] Now when an electric utility contracts to buy electricity, the managers of the utility want to make darned sure that the seller will deliver the electrons exactly as agreed, at the contracted price. There is no room for fudging on this because the consequences of not having the electricity when consumers switch on their lights are dire. . . .

This means that the firms with whom Enron was trading electricity . . . had to trust Enron. And trust Enron they did, to the tune of billions of dollars of trades every year. But in October 2001, when Enron announced that its previous financial statements overstated the firm's profits, it undermined such trust. As everyone recognizes, the announcement caused investors to lower their valuations of the firm. Less understood, however, was the more important impact of the announcement; by revealing some of its reported earnings to be a house of cards, Enron sabotaged its reputation. The effect was to undermine even its legitimate and (previously) profitable operations that relied on its trustworthiness.

This is why Enron melted down so fast. Its core businesses relied on the firm's reputation. When that reputation was wounded, energy traders took their business elsewhere. . . .

Energy traders lost their faith in Enron, but what if no other company could be trusted to deliver on its commitments to provide electricity as contracted? In that case, energy traders would have nowhere to turn. As a direct result, energy producers with surplus generating capacity would be unable to

⁶James Surowiecki, "A Virtuous Cycle," *Forbes*, December 23, 2002, pp. 248–256. Reprinted by Permission of Forbes Magazine ©2006 Forbes Inc.

(continued)

sell their surplus power. As a consequence, their existing customers would have to pay higher prices. And utilities that did not have sufficient capacity to meet demand on their own would have to build more capacity, which would also mean higher prices for their consumers. So a general lack of trust in companies such as Enron would ultimately result in overinvestment in energy-generating capacity and higher energy prices for consumers.

Source: Jonathan M. Karpoff, "Regulation vs. Reputation in Preventing Corporate Fraud," *UW Business*, Spring 2002, pp. 28–30.

Thus, for the good of everyone—including profit-making companies—it is vitally important that business be conducted within an ethical framework that builds and sustains trust.

The Institute of Management Accountants (IMA) of the United States has adopted an ethical code called the *Statement of Ethical Professional Practice* that describes in some detail the ethical responsibilities of management accountants. Even though the standards were specifically developed for management accountants, they have much broader application.

Code of Conduct for Management Accountants

The IMA's Statement of Ethical Professional Practice consists of two parts that are presented in full in Exhibit P-7. The first part provides general guidelines for ethical behavior. In a nutshell, a management accountant has ethical responsibilities in four broad areas: first, to maintain a high level of professional competence; second, to treat sensitive matters with confidentiality; third, to maintain personal integrity; and fourth, to disclose information in a credible fashion. The second part of the standards specifies what should be done if an individual finds evidence of ethical misconduct. We recommend that you stop at this point and read all of Exhibit P-7.

The ethical standards provide sound, practical advice for management accountants and managers. Most of the rules in the ethical standards are motivated by a very practical consideration—if these rules were not generally followed in business, then the economy and all of us would suffer. Consider the following specific examples of the consequences of not abiding by the standards:

- Suppose employees could not be trusted with confidential information. Then top managers would be reluctant to distribute such information within the company and, as a result, decisions would be based on incomplete information and operations would deteriorate.
- Suppose employees accepted bribes from suppliers. Then contracts would tend to go to suppliers who pay the highest bribes rather than to the most competent suppliers. Would you like to fly in aircraft whose wings were made by the subcontractor who paid the highest bribe? Would you fly as often? What would happen to the airline industry if its safety record deteriorated due to shoddy workmanship on contracted parts and assemblies?
- Suppose the presidents of companies routinely lied in their annual reports and financial statements. If investors could not rely on the basic integrity of a company's financial statements, they would have little basis for making informed decisions. Suspecting the worst, rational investors would pay less for securities issued by companies and might not be willing to invest at all. As a consequence, companies would have less money for productive investments—leading to slower economic growth, fewer goods and services, and higher prices.

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.

RESOLUTION OF ETHICAL CONFLICT

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

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.

EXHIBIT P-7

IMA Statement of Ethical Professional Practice

As these examples suggest, if ethical standards were not generally adhered to, everyone would suffer—businesses as well as consumers. Essentially, abandoning ethical standards would lead to a lower standard of living with lower-quality goods and services, less to choose from, and higher prices. In short, following ethical rules such as those in the Statement of Ethical Professional Practice is absolutely essential for the smooth functioning of an advanced market economy.

Company Codes of Conduct

Many companies have adopted formal ethical codes of conduct. These codes are generally broad-based statements of a company's responsibilities to its employees, its customers, its suppliers, and the communities in which the company operates. Codes rarely spell out specific do's and don'ts or suggest proper behavior in a specific situation. Instead, they give broad guidelines. For example, Exhibit P-8 shows **Johnson & Johnson's** code of ethical conduct, which it refers to as a Credo. Johnson & Johnson created its Credo in 1943 and today it is translated into 36 languages. Johnson & Johnson surveys its employees every two to three years to obtain their impressions of how well the company adheres to its ethical principles. If the survey reveals shortcomings, corrective actions are taken.⁷

IN BUSINESS

Who is to Blame?

Don Keough, a retired **Coca-Cola** executive, recalls that, "In my time, CFOs [Chief Financial Officers] were basically tough, smart, and mean. Bringing good news wasn't their function. They were the truth-tellers." But that had changed by the late 1990s in some companies. Instead of being truth-tellers, CFOs became corporate spokesmen, guiding stock analysts in their quarterly earnings estimates—and then making sure those earnings estimates were beaten using whatever means necessary, including accounting tricks and in some cases outright fraud. But does the buck stop there?

A survey of 179 CFOs published in May 2004 showed that only 38% of those surveyed believed that pressure to use aggressive accounting techniques to improve results had lessened relative to three years earlier. And 20% of those surveyed said the pressure had increased over the past three years. Where did the respondents say the pressure was coming from? Personal greed, weak boards of directors, and overbearing Chief Executive Officers (CEOs) topped the list. Who is to blame? Perhaps that question is less important than focusing on what is needed—greater personal integrity and less emphasis on meeting quarterly earnings estimates.

Sources: Jeremy Kahn, "The Chief Freaked Out Officer," *Fortune*, December 9, 2002, pp. 197–202; and Don Durfee, "After the Scandals: It's Better (and Worse) than You Think," *CFO*, May 2004, p. 29.

It bears emphasizing that establishing a code of ethical conduct, such as Johnson & Johnson's Credo, is meaningless if employees, and in particular top managers, do not adhere to it when making decisions. If top managers continue to say, in effect, that they will only be satisfied with bottom-line results and will accept no excuses, they are building a culture that implicitly coerces employees to engage in unethical behavior to get ahead. This type of unethical culture is contagious. In fact, one survey showed that "[t]hose who engage in unethical behavior often justify their actions with one or more of the following reasons: (1) the organization expects unethical behavior, (2) everyone else is unethical, and/or (3) behaving unethically is the only way to get ahead."⁸

⁷www.jnj.com/our_company/our_credo

⁸Michael K. McCuddy, Karl E. Reichardt, and David Schroeder, "Ethical Pressures: Fact or Fiction?" *Management Accounting* 74, no. 10, pp. 57–61.

Johnson & Johnson Credo

We believe our first responsibility is to the doctors, nurses and patients, to mothers and fathers and all others who use our products and services. In meeting their needs everything we do must be of high quality. We must constantly strive to reduce our costs in order to maintain reasonable prices. Customers' orders must be serviced promptly and accurately. Our suppliers and distributors must have an opportunity to make a fair profit.

We are responsible to our employees, the men and women who work with us throughout the world. Everyone must be considered as an individual. We must respect their dignity and recognize their merit. They must have a sense of security in their jobs. Compensation must be fair and adequate, and working conditions clean, orderly and safe. We must be mindful of ways to help our employees fulfill their family responsibilities. Employees must feel free to make suggestions and complaints. There must be equal opportunity for employment, development and advancement for those qualified. We must provide competent management, and their actions must be just and ethical.

We are responsible to the communities in which we live and work and to the world community as well. We must be good citizens—support good works and charities and bear our fair share of taxes. We must encourage civic improvements and better health and education. We must maintain in good order the property we are privileged to use, protecting the environment and natural resources.

Our final responsibility is to our stockholders. Business must make a sound profit. We must experiment with new ideas. Research must be carried on, innovative programs developed and mistakes paid for. New equipment must be purchased, new facilities provided and new products launched. Reserves must be created to provide for adverse times. When we operate according to these principles, the stockholders should realize a fair return.

EXHIBIT P-8

The Johnson & Johnson Credo

Where Would You Like to Work?**IN BUSINESS**

Nearly all executives claim that their companies maintain high ethical standards; however, not all executives walk the talk. Employees usually know when top executives are saying one thing and doing another and they also know that these attitudes spill over into other areas. Working in companies where top managers pay little attention to their own ethical rules can be extremely unpleasant. Several thousand employees in many different organizations were asked if they would recommend their company to prospective employees. Overall, 66% said that they would. Among those employees who believed that their top management strives to live by the company's stated ethical standards, the number of recommenders jumped to 81%. But among those who believed top management did not follow the company's stated ethical standards, the number was just 21%.

Source: Jeffrey L. Seglin, "Good for Goodness' Sake," *CFO*, October 2002, pp. 75–78.

Codes of Conduct on the International Level

The Code of Ethics for Professional Accountants, issued by the International Federation of Accountants (IFAC), governs the activities of all professional accountants throughout the world, regardless of whether they are practicing as independent CPAs, employed in government service, or employed as internal accountants.⁹

In addition to outlining ethical requirements in matters dealing with integrity and objectivity, resolution of ethical conflicts, competence, and confidentiality, the IFAC's code also outlines the accountant's ethical responsibilities in other matters such as those relating to taxes, independence, fees and commissions, advertising and solicitation,

⁹A copy of this code can be obtained on the International Federation of Accountants' website www.ifac.org.

the handling of monies, and cross-border activities. Where cross-border activities are involved, the IFAC ethical requirements must be followed if they are stricter than the ethical requirements of the country in which the work is being performed.

CORPORATE GOVERNANCE

Effective *corporate governance* enhances stockholders' confidence that a company is being run in their best interests rather than in the interests of top managers. **Corporate governance** is the system by which a company is directed and controlled. If properly implemented, the corporate governance system should provide incentives for the board of directors and top management to pursue objectives that are in the interests of the company's owners and it should provide for effective monitoring of performance.¹⁰

Unfortunately, history has repeatedly shown that unscrupulous top managers, if unchecked, can exploit their power to defraud stockholders. This unpleasant reality became all too clear in 2001 when the fall of **Enron** kicked off a wave of corporate scandals. These scandals were characterized by financial reporting fraud and misuse of corporate funds at the very highest levels—including CEOs and CFOs. While this was disturbing in itself, it also indicated that the institutions intended to prevent such abuses weren't working, thus raising fundamental questions about the adequacy of the existing corporate governance system. In an attempt to respond to these concerns, the U.S. Congress passed the most important reform of corporate governance in many decades—*The Sarbanes-Oxley Act of 2002*.

IN BUSINESS

Spilled Milk at Parmalat

Corporate scandals have not been limited to the United States. In 2003, **Parmalat**, a publicly traded dairy company in Italy, went bankrupt. The CEO, Calisto Tanzi, admitted to manipulating the books for more than a decade so that he could skim off \$640 million to cover losses at various of his family businesses. But the story doesn't stop there. Parmalat's balance sheet contained \$13 billion in nonexistent assets, including a \$5 billion **Bank of America** account that didn't exist. All in all, Parmalat was the biggest financial fraud in European history.

Source: Gail Edmondson, David Fairlamb, and Nanette Byrnes, "The Milk Just Keeps On Spilling," *BusinessWeek*, January 26, 2004, pp. 54–58.

The Sarbanes-Oxley Act of 2002

The **Sarbanes-Oxley Act of 2002** was intended to protect the interests of those who invest in publicly traded companies by improving the reliability and accuracy of corporate financial reports and disclosures. We would like to highlight six key aspects of the legislation.¹¹

First, the Act requires that both the CEO and CFO certify in writing that their company's financial statements and accompanying disclosures fairly represent the results of operations—with possible jail time if a CEO or CFO certifies results that they know are false. This creates very powerful incentives for the CEO and CFO to ensure that the financial statements contain no misrepresentations.

¹⁰This definition of corporate governance was adapted from the 2004 report titled *OECD Principles of Corporate Governance* published by the Organization for Economic Co-Operation and Development.

¹¹A summary of the Sarbanes-Oxley Act of 2002 can be obtained from the American Institute of Certified Public Accountants (AICPA) website <http://thecaq.aicpa.org/Resources/Sarbanes+Oxley>.

Second, the Act established the Public Company Accounting Oversight Board to provide additional oversight over the audit profession. The Act authorizes the Board to conduct investigations, to take disciplinary actions against audit firms, and to enact various standards and rules concerning the preparation of audit reports.

Third, the Act places the power to hire, compensate, and terminate the public accounting firm that audits a company's financial reports in the hands of the audit committee of the board of directors. Previously, management often had the power to hire and fire its auditors. Furthermore, the Act specifies that all members of the audit committee must be independent, meaning that they do not have an affiliation with the company they are overseeing, nor do they receive any consulting or advisory compensation from the company.

Fourth, the Act places important restrictions on audit firms. Historically, public accounting firms earned a large part of their profits by providing consulting services to the companies that they audited. This provided the appearance of a lack of independence because a client that was dissatisfied with an auditor's stance on an accounting issue might threaten to stop using the auditor as a consultant. To avoid this possible conflict of interests, the Act prohibits a public accounting firm from providing a wide variety of nonauditing services to an audit client.

Fifth, the Act requires that a company's annual report contain an *internal control report*. Internal controls are put in place by management to provide assurance to investors that financial disclosures are reliable. The report must state that it is management's responsibility to establish and maintain adequate internal controls and it must contain an assessment by management of the effectiveness of its internal control structure. The internal control report is accompanied by an opinion from the company's audit firm as to whether management has maintained effective internal control over its financial reporting process.

Finally, the Act establishes severe penalties of as many as 20 years in prison for altering or destroying any documents that may eventually be used in an official proceeding and as many as 10 years in prison for managers who retaliate against a so-called whistle-blower who goes outside the chain of command to report misconduct. Collectively, these six aspects of the Sarbanes-Oxley Act of 2002 should help reduce the incidence of fraudulent financial reporting.

Sarbanes-Oxley Takes its Toll on CFOs

IN BUSINESS

Bank of America's stock price rose 13% while Alvaro DeMolina was its Chief Financial Officer (CFO). Yet, after 18 months DeMolina resigned from his job because it was "suffocating" and "less fun." DeMolina is one of many CFOs who attribute their job dissatisfaction to The Sarbanes-Oxley Act of 2002 (SOX). A survey of 237 CFOs showed that 75% of them believe SOX significantly increased their workload and 49% feel that SOX makes their job less satisfying. The turnover rate among CFOs of \$1 billion companies increased from 7% in 2002 to 21% in 2005. Thanks to SOX, CFOs are spending too much time certifying stacks of documents and responding to tedious inquiries from the board of directors, and less time on the strategic and creative endeavors of managing internal operations.

Source: Telis Demos, "CFO: All Pain, No Gain," *Fortune*, February 5, 2007, pp. 18–19; Ghostwriter, "Sore About Sarbox," *BusinessWeek*, March 13, 2006, p. 13.

ENTERPRISE RISK MANAGEMENT

Businesses face risks every day. Some risks are foreseeable. For example, a company could reasonably be expected to foresee the possibility of a natural disaster or a fire destroying its centralized data storage facility. Companies respond to this type of risk by maintaining off-site backup data storage facilities. Other risks are unforeseeable. For

example, in 1982 **Johnson & Johnson** never could have imagined that a deranged killer would insert poison into bottles of Tylenol and then place these tainted bottles on retail shelves, ultimately killing seven people.¹² Johnson & Johnson—guided by the first line of its Credo (see page 17)—responded to this crisis by acting to reduce the risks faced by its customers and itself. First, it immediately recalled and destroyed 31 million bottles of Tylenol with a retail value of \$100 million to reduce the risk of additional fatalities. Second, it developed the tamper-resistant packaging that we take for granted today to reduce the risk that the same type of crime could be repeated in the future.

Every business strategy or decision involves risks. **Enterprise risk management** is a process used by a company to proactively identify and manage those risks.

Identifying and Controlling Business Risks

Companies should identify foreseeable risks before they occur rather than react to unfortunate events that have already happened. The left-hand column of Exhibit P-9 provides 12 examples of business risks. This list is not exhaustive, rather its purpose is to illustrate the diverse nature of business risks that companies face. Whether the risks relate to the

EXHIBIT P-9 Identifying and Controlling Business Risks

Examples of Business Risks	Examples of Controls to Reduce Business Risks
<ul style="list-style-type: none"> Intellectual assets being stolen from computer files 	<ul style="list-style-type: none"> Create firewalls that prohibit computer hackers from corrupting or stealing intellectual property
<ul style="list-style-type: none"> Products harming customers 	<ul style="list-style-type: none"> Develop a formal and rigorous new product testing program
<ul style="list-style-type: none"> Losing market share due to the unforeseen actions of competitors 	<ul style="list-style-type: none"> Develop an approach for legally gathering information about competitors' plans and practices
<ul style="list-style-type: none"> Poor weather conditions shutting down operations 	<ul style="list-style-type: none"> Develop contingency plans for overcoming weather-related disruptions
<ul style="list-style-type: none"> A website malfunctioning 	<ul style="list-style-type: none"> Thoroughly test the website before going "live" on the Internet
<ul style="list-style-type: none"> A supplier strike halting the flow of raw materials 	<ul style="list-style-type: none"> Establish a relationship with two companies capable of providing needed raw materials
<ul style="list-style-type: none"> A poorly designed incentive compensation system causing employees to make bad decisions 	<ul style="list-style-type: none"> Create a balanced set of performance measures that motivates the desired behavior
<ul style="list-style-type: none"> Financial statements inaccurately reporting the value of inventory 	<ul style="list-style-type: none"> Count the physical inventory on hand to make sure that it agrees with the accounting records
<ul style="list-style-type: none"> An employee stealing assets 	<ul style="list-style-type: none"> Segregate duties so that the same employee does not have physical custody of an asset and the responsibility of accounting for it
<ul style="list-style-type: none"> An employee accessing unauthorized information 	<ul style="list-style-type: none"> Create password-protected barriers that prohibit employees from obtaining information not needed to do their jobs
<ul style="list-style-type: none"> Inaccurate budget estimates causing excessive or insufficient production 	<ul style="list-style-type: none"> Implement a rigorous budget review process
<ul style="list-style-type: none"> Failing to comply with equal employment opportunity laws 	<ul style="list-style-type: none"> Create a report that tracks key metrics related to compliance with the laws

¹²Tamara Kaplan, "The Tylenol Crisis: How Effective Public Relations Saved Johnson & Johnson," in Glen Broom, Allen Center, and Scott Cutlip, *Effective Public Relations*, Prentice Hall, Upper Saddle River, NJ.

Managing Weather Risk

IN BUSINESS

The **National Oceanic and Atmospheric Administration** claims that the weather influences one-third of the U.S. gross domestic product. In 2004, the word *unseasonable* was used by more than 120 publicly traded companies to explain unfavorable financial performance. Indeed, it would be easy to conclude that the weather poses an uncontrollable risk to businesses, right? Wrong! Weather risk management is a growing industry with roughly 80 companies offering weather risk management services to clients.

For example, **Planalytics** is a weather consulting firm that helps **Wise Metal Group**, a manufacturer of aluminum can sheeting, to manage its natural gas purchases. Wise's \$3 million monthly gas bill fluctuates sharply depending on the weather. Planalytics' software helps Wise plan its gas purchases in advance of changing temperatures. Beyond influencing natural gas purchases, the weather can also delay the boats that deliver Wise's raw materials and it can affect Wise's sales to the extent that cooler weather conditions lead to a decline in canned beverage sales.

Source: Abraham Lustgarten, "Getting Ahead of the Weather," *Fortune*, February 7, 2005, pp. 87–94.

weather, computer hackers, complying with the law, employee theft, financial reporting, or strategic decision making, they all have one thing in common. If the risks are not managed effectively, they can infringe on a company's ability to meet its goals.

Once a company identifies its risks, it can respond to them in various ways such as accepting, avoiding, or reducing the risk. Perhaps the most common risk management tactic is to reduce risks by implementing specific controls. The right-hand column of Exhibit P-9 provides an example of a control that could be implemented to help reduce each of the risks mentioned in the left-hand column of the exhibit.

In conclusion, a sophisticated enterprise risk management system cannot guarantee that all risks are eliminated. Nonetheless, many companies understand that managing risks is a superior alternative to reacting, perhaps too late, to unfortunate events.

CORPORATE SOCIAL RESPONSIBILITY

Companies are responsible for producing financial results that satisfy stockholders. However, they also have a *corporate social responsibility* to serve other stakeholders—such as customers, employees, suppliers, communities, and environmental and human rights advocates—whose interests are tied to the company's performance. **Corporate social responsibility (CSR)** is a concept whereby organizations consider the needs of all stakeholders when making decisions. CSR extends beyond legal compliance to include voluntary actions that satisfy stakeholder expectations. Numerous companies, such as **Procter & Gamble, 3M, Eli Lilly and Company, Starbucks, Microsoft, Genentech, Johnson & Johnson, Baxter International, Abbott Laboratories, KPMG, National City Bank, Deloitte, Southwest Airlines, and Caterpillar**, prominently describe their corporate social performance on their websites.

Exhibit P-10 presents examples of corporate social responsibilities that are of interest to six stakeholder groups. Many companies are paying increasing attention to these types of broadly defined responsibilities for four reasons. First, socially responsible investors control more than \$2.3 trillion of investment capital. Companies that want access to this capital must excel in terms of their social performance. Second, a growing number of employees want to work for a company that recognizes and responds to its social responsibilities. If companies hope to recruit and retain these highly skilled employees, then they must offer fulfilling careers that serve the needs of broadly defined stakeholders. Third, many customers seek to purchase products and services from socially responsible companies. The Internet enables these customers to readily locate competing products, thereby making it even easier to avoid doing business with undesirable companies.

EXHIBIT P-10

Examples of Corporate Social Responsibilities

Companies should provide *customers* with:

- Safe, high-quality products that are fairly priced.
- Competent, courteous, and rapid delivery of products and services.
- Full disclosure of product-related risks.
- Easy-to-use information systems for shopping and tracking orders.

Companies should provide *suppliers* with:

- Fair contract terms and prompt payments.
- Reasonable time to prepare orders.
- Hassle-free acceptance of timely and complete deliveries.
- Cooperative rather than unilateral actions.

Companies should provide *stockholders* with:

- Competent management.
- Easy access to complete and accurate financial information.
- Full disclosure of enterprise risks.
- Honest answers to knowledgeable questions.

Companies and their suppliers should provide *employees* with:

- Safe and humane working conditions.
- Nondiscriminatory treatment and the right to organize and file grievances.
- Fair compensation.
- Opportunities for training, promotion, and personal development.

Companies should provide *communities* with:

- Payment of fair taxes.
- Honest information about plans such as plant closings.
- Resources that support charities, schools, and civic activities.
- Reasonable access to media sources.

Companies should provide *environmental and human rights advocates* with:

- Greenhouse gas emissions data.
- Recycling and resource conservation data.
- Child labor transparency.
- Full disclosure of suppliers located in developing countries.

Fourth, nongovernment organizations (NGOs) and activists are more capable than ever of tarnishing a company's reputation by publicizing its environmental or human rights missteps. The Internet has enabled these environmental and human rights advocacy groups to better organize their resources, spread negative information, and take coordinated actions against offending companies.¹³

IN BUSINESS**Skill-Based Volunteerism Grows in Popularity**

Ernst & Young, a "Big 4" public accounting firm, paid one of its managers to spend 12 weeks in Buenos Aires providing free accounting services to a small publishing company. **UPS** paid one of its logistics supervisors to help coordinate the **Susan G. Komen Breast Cancer Foundation's** annual Race for the Cure event. Why are these companies paying their employees to work for other organizations? A survey of 1,800 people ages 13–25 revealed that 79% intend to seek employment with companies that care about contributing to society—underscoring the value of skill-based volunteerism as an employee recruiting and retention tool. Furthermore, enabling employees to apply their skills in diverse business contexts makes them more effective when they return to their regular jobs.

Source: Sarah E. Needleman, "The Latest Office Perk: Getting Paid to Volunteer," *The Wall Street Journal*, April 29, 2008, pp. D1 and D5.

¹³The insights from this paragraph and many of the examples in Exhibit P-10 were drawn from Ronald W. Clement, "The Lessons from Stakeholder Theory for U.S. Business Leaders," *Business Horizons*, May/June 2005, pp. 255–264; and Terry Leap and Misty L. Loughry, "The Stakeholder-Friendly Firm," *Business Horizons*, March/April 2004, pp. 27–32.

It is important to understand that a company’s social performance can impact its financial performance. For example, if a company’s poor social performance alienates customers, then its revenues and profits will suffer. This reality explains why companies use enterprise risk management, as previously described, to meet the needs of *all* stakeholders.

THE CERTIFIED MANAGEMENT ACCOUNTANT (CMA)

An individual who possesses the necessary qualifications and who passes a rigorous professional exam earns the right to be known as a *Certified Management Accountant (CMA)*. In addition to the prestige that accompanies a professional designation, CMAs are often given greater responsibilities and higher compensation than those who do not have such a designation. Information about becoming a CMA and the CMA program can be accessed on the Institute of Management Accountants’ (IMA) website www.imanet.org or by calling 1-800-638-4427.

To become a Certified Management Accountant, the following four steps must be completed:

1. File an Application for Admission and register for the CMA examination.
2. Pass all four parts of the CMA examination within a three-year period.
3. Satisfy the experience requirement of two continuous years of professional experience in management and/or financial accounting prior to or within seven years of passing the CMA examination.
4. Comply with the Statement of Ethical Professional Practice.

How’s the Pay?

IN BUSINESS

The Institute of Management Accountants has created the following table that allows an individual to estimate what his salary would be as a management accountant. (The table below applies specifically to men. A similar table exists for women.)

		Your Calculation	
Start with this base amount		\$70,449	\$70,449
If you are top-level management	ADD	\$25,484	
OR, if you are entry-level management	SUBTRACT	\$24,475	
Number of years in the field _____	TIMES	\$702	
If you have an advanced degree	ADD	\$11,473	
OR, if you have no degree	SUBTRACT	\$27,283	
If you hold the CMA	ADD	\$14,874	
OR, if you hold the CPA	ADD	\$12,320	
OR, if you hold both CMA and CPA	ADD	\$18,128	
Your estimated salary level			_____

For example, if you make it to top-level management in 10 years, have an advanced degree and a CMA, your estimated salary would be \$129,300 [$\$70,449 + \$25,484 + (10 \times \$702) + \$11,473 + \$14,874$].

Source: David L. Schroeder and Karl E. Reichardt, “IMA 2006 Salary Survey,” *Strategic Finance*, June 2007, pp. 22–38.

SUMMARY

Successful companies follow strategies that differentiate themselves from competitors. Strategies often focus on three customer value propositions—customer intimacy, operational excellence, and product leadership.

Most organizations rely on decentralization to some degree. Decentralization is formally depicted in an organization chart that shows who works for whom and which units perform line and staff functions.

Lean Production, the Theory of Constraints, and Six Sigma are three management approaches that focus on business processes. Lean Production organizes resources around business processes and pulls units through those processes in response to customer orders. The result is lower inventories, fewer defects, less wasted effort, and quicker customer response times. The Theory of Constraints emphasizes the importance of managing an organization's constraints. Because the constraint is whatever is holding back the organization, improvement efforts usually must be focused on the constraint to be effective. Six Sigma uses the DMAIC (Define, Measure, Analyze, Improve, and Control) framework to eliminate non-value-added activities and to improve processes.

Ethical behavior is the foundation of a successful market economy. If we cannot trust others to act ethically in their business dealings with us, we will be inclined to invest less, scrutinize purchases more, and generally waste time and money trying to protect ourselves from the unscrupulous—resulting in fewer goods available to consumers at higher prices and lower quality.

Unfortunately, trust in our corporate governance system has been undermined by numerous high-profile financial reporting scandals. The Sarbanes-Oxley Act of 2002 was passed with the objective of improving the reliability of the financial disclosures provided by publicly traded companies.

All organizations face risks that they should proactively identify and respond to by accepting, avoiding, or reducing the risk. They also have a corporate social responsibility to serve a wide variety of stakeholders including stockholders, customers, employees, suppliers, and communities.

GLOSSARY

At the end of each chapter, a list of key terms for review is given, along with the definition of each term. (These terms are printed in boldface where they are defined in the chapter.) Carefully study each term to be sure you understand its meaning. The list for the Prologue follows.

Business process A series of steps that are followed to carry out some task in a business. (p. 7)

Chief Financial Officer (CFO) The member of the top management team who is responsible for providing timely and relevant data to support planning and control activities and for preparing financial statements for external users. (p. 6)

Constraint Anything that prevents an organization or individual from getting more of what it wants. (p. 10)

Controller The member of the top management team who is responsible for providing relevant and timely data to managers and for preparing financial statements for external users. The controller reports to the CFO. (p. 7)

Corporate governance The system by which a company is directed and controlled. If properly implemented it should provide incentives for top management to pursue objectives that are in the interests of the company and it should effectively monitor performance. (p. 18)

Corporate social responsibility A concept whereby organizations consider the needs of all stakeholders when making decisions. It extends beyond legal compliance to include voluntary actions that satisfy stakeholder expectations. (p. 21)

Decentralization The delegation of decision-making authority throughout an organization by providing managers with the authority to make decisions relating to their area of responsibility. (p. 5)

Enterprise risk management A process used by a company to help identify the risks that it faces and to develop responses to those risks that enable the company to be reasonably assured of meeting its goals. (p. 20)

- Finished goods** Units of product that have been completed but have not yet been sold to customers. (p. 8)
- Just-in-time (JIT)** A production and inventory control system in which materials are purchased and units are produced only as needed to meet actual customer demand. (p. 9)
- Lean thinking model** A five-step management approach that organizes resources around the flow of business processes and that pulls units through these processes in response to customer orders. (p. 8)
- Line** A position in an organization that is directly related to the achievement of the organization's basic objectives. (p. 6)
- Non-value-added activities** Activities that consume resources but do not add value for which customers are willing to pay. (p. 12)
- Organization chart** A diagram of a company's organizational structure that depicts formal lines of reporting, communication, and responsibility between managers. (p. 5)
- Raw materials** Materials that are used to make a product. (p. 8)
- Sarbanes-Oxley Act of 2002** Legislation enacted to protect the interests of stockholders who invest in publicly traded companies by improving the reliability and accuracy of the disclosures provided to them. (p. 18)
- Six Sigma** A method that relies on customer feedback and objective data gathering and analysis techniques to drive process improvement. (p. 11)
- Staff** A position in an organization that is only indirectly related to the achievement of the organization's basic objectives. Such positions provide service or assistance to line positions or to other staff positions. (p. 6)
- Strategy** A "game plan" that enables a company to attract customers by distinguishing itself from competitors. (p. 4)
- Supply chain management** A management approach that coordinates business processes across companies to better serve end consumers. (p. 10)
- Theory of Constraints (TOC)** A management approach that emphasizes the importance of managing constraints. (p. 10)
- Value chain** The major business functions that add value to a company's products and services such as research and development, product design, manufacturing, marketing, distribution, and customer service. (p. 7)
- Work in process** Units of product that are only partially complete and will require further work before they are ready for sale to a customer. (p. 8)

1

Managerial Accounting and Cost Concepts

<< A LOOK BACK

In the Prologue, we established the business context within which management accounting operates. We discussed topics such as strategy, Lean Production, and corporate governance that influence how managers perform their jobs. In addition, we introduced Good Vibrations, an international retailer of music CDs, and learned about its organizational structure.

A LOOK AT THIS CHAPTER

After describing the three major activities of managers in the context of Good Vibrations, this chapter compares and contrasts financial and managerial accounting. We define many of the terms that are used to classify costs in business. Because these terms will be used throughout the text, you should be sure that you are familiar with each of them.

A LOOK AHEAD >>

Chapters 2, 3, and 4 describe costing systems that are used to compute product costs. Chapter 2 describes job-order costing. Chapter 3 describes activity-based costing, an elaboration of job-order costing. Chapter 4 covers process costing.

CHAPTER OUTLINE

The Work of Management and the Need for Managerial Accounting Information

- Planning
- Directing and Motivating
- Controlling
- The End Results of Managers' Activities
- The Planning and Control Cycle

Comparison of Financial and Managerial Accounting

- Emphasis on the Future
- Relevance of Data
- Less Emphasis on Precision
- Segments of an Organization
- Generally Accepted Accounting Principles (GAAP)
- Managerial Accounting—Not Mandatory

General Cost Classifications

- Manufacturing Costs
- Nonmanufacturing Costs

Product Costs versus Period Costs

- Product Costs
- Period Costs
- Prime Cost and Conversion Cost

Cost Classifications on Financial Statements

- The Balance Sheet
- The Income Statement
- Schedule of Cost of Goods Manufactured

Product Cost Flows

- Inventoriable Costs
- An Example of Cost Flows

Cost Classifications for Predicting Cost Behavior

- Variable Cost
- Fixed Cost

Cost Classifications for Assigning Costs to Cost Objects

- Direct Cost
- Indirect Cost

Cost Classifications for Decision Making

- Differential Cost and Revenue
- Opportunity Cost
- Sunk Cost



DECISION FEATURE

Management Accounting: It's More than Just Crunching Numbers

“Creating value through values” is the credo of today’s management accountant. It means that management accountants should maintain an unwavering commitment to ethical values while using their knowledge and skills to influence decisions that create value for organizational stakeholders. These skills include managing risks and implementing strategy through planning, budgeting and forecasting, and decision support. Management accountants are strategic business partners who understand the financial and operational sides of the business. They report and analyze not only financial measures, but also nonfinancial measures of process performance and corporate social performance. Think of these responsibilities as profits (financial statements), process (customer focus and satisfaction), people (employee learning and satisfaction), and planet (environmental stewardship).

Source: Conversation with Jeff Thomson, president and CEO of the Institute of Management Accountants.

LEARNING OBJECTIVES



After studying Chapter 1, you should be able to:

LO1 Identify the major differences and similarities between financial and managerial accounting.

LO2 Identify and give examples of each of the three basic manufacturing cost categories.

LO3 Distinguish between product costs and period costs and give examples of each.

LO4 Prepare an income statement including calculation of the cost of goods sold.

LO5 Prepare a schedule of cost of goods manufactured.

LO6 Understand the differences between variable costs and fixed costs.

LO7 Understand the differences between direct and indirect costs.

LO8 Understand cost classifications used in making decisions: differential costs, opportunity costs, and sunk costs.

This chapter begins by describing the work of management and the need for managerial accounting information followed by a discussion of the differences and similarities between financial and managerial accounting. Next, we explain that in managerial accounting, the term cost is used in many different ways. The reason is that there are many types of costs, and these costs are classified differently according to the immediate needs of management. For example, managers may want cost data to prepare external financial reports, to prepare planning budgets, or to make decisions. Each different use of cost data demands a different classification and definition of costs. For example, the preparation of external financial reports requires the use of historical cost data, whereas decision making may require predictions about future costs. This notion of different costs for different purposes is a critically important aspect of managerial accounting.

THE WORK OF MANAGEMENT AND THE NEED FOR MANAGERIAL ACCOUNTING INFORMATION

Every organization—large and small—has managers. Someone must be responsible for formulating strategy, making plans, organizing resources, directing personnel, and controlling operations. This is true of the **Bank of America**, the **Peace Corps**, the **University of Illinois**, the **Red Cross**, and the **Coca-Cola Corporation**, as well as the local **7-Eleven** convenience store. In this chapter, we will use a particular organization—Good Vibrations, Inc.—to illustrate the work of management. What we have to say about the management of Good Vibrations, however, is very general and can be applied to virtually any organization.

Good Vibrations runs a chain of retail outlets that sells a full range of music CDs. The chain's stores are concentrated in Pacific Rim cities such as Sydney, Singapore, Hong Kong, Beijing, Tokyo, and Vancouver. The company has found that the best way to generate sales and profits is to create an exciting shopping environment following a customer intimacy strategy. Consequently, the company puts a great deal of effort into planning the layout and decor of its stores—which are often quite large and extend over several floors in key downtown locations. Management knows that different types of clientele are attracted to different kinds of music. The international rock section is generally decorated with bold, brightly colored graphics, and the aisles are purposely narrow to create a crowded feeling much like one would experience at a popular nightclub on Friday night. In contrast, the classical music section is wood-paneled and fully sound insulated, with the rich, spacious feeling of a country club meeting room.

Managers at Good Vibrations like managers everywhere, carry out three major activities—*planning, directing and motivating*, and *controlling*. **Planning** involves establishing a basic strategy, selecting a course of action, and specifying how the action will be implemented. **Directing and motivating** involves mobilizing people to carry out plans and run routine operations. **Controlling** involves ensuring that the plan is actually carried out and is appropriately modified as circumstances change. Management accounting information plays a vital role in these basic management activities—but most particularly in the planning and control functions.

Planning

An important part of planning is to identify alternatives and then to select from among the alternatives the one that best fits the organization's strategy and objectives. The basic objective of Good Vibrations is to earn profits for the owners of the company by providing superior service at competitive prices in as many markets as possible. To further this strategy, every year top management carefully considers a range of options, or alternatives, for expanding into new geographic markets. This year management is considering opening new stores in Shanghai, Los Angeles, and Auckland.

When making this choice, management must balance the potential benefits of opening a new store against the costs and demands on the company's resources. Management knows from bitter experience that opening a store in a major new market is a big step that cannot be taken lightly. It requires enormous amounts of time and energy from the company's most experienced, talented, and busy professionals. When the company attempted to open stores in both Beijing and Vancouver in the same year, resources were stretched too thinly. The result was that neither store opened on schedule, and operations in the rest of the company suffered. Therefore, Good Vibrations plans very carefully before entering a new market.

Among other data, top management looks at the sales volumes, profit margins, and costs of the company's established stores in similar markets. These data, supplied by the management accountant, are combined with projected sales volume data at the proposed new locations to estimate the profits that would be generated by the new stores. In general, virtually all important alternatives considered by management in the planning process impact revenues or costs, and management accounting data are essential in estimating those impacts.

After considering all of the alternatives, Good Vibrations' top management decided to open a store in the booming Shanghai market in the third quarter of the year, but to defer opening any other new stores to another year. As soon as this decision was made, detailed plans were drawn up for all parts of the company that would be involved in the Shanghai opening. For example, the Personnel Department's travel budget was increased because it would be providing extensive on-site training to the new personnel hired in Shanghai.

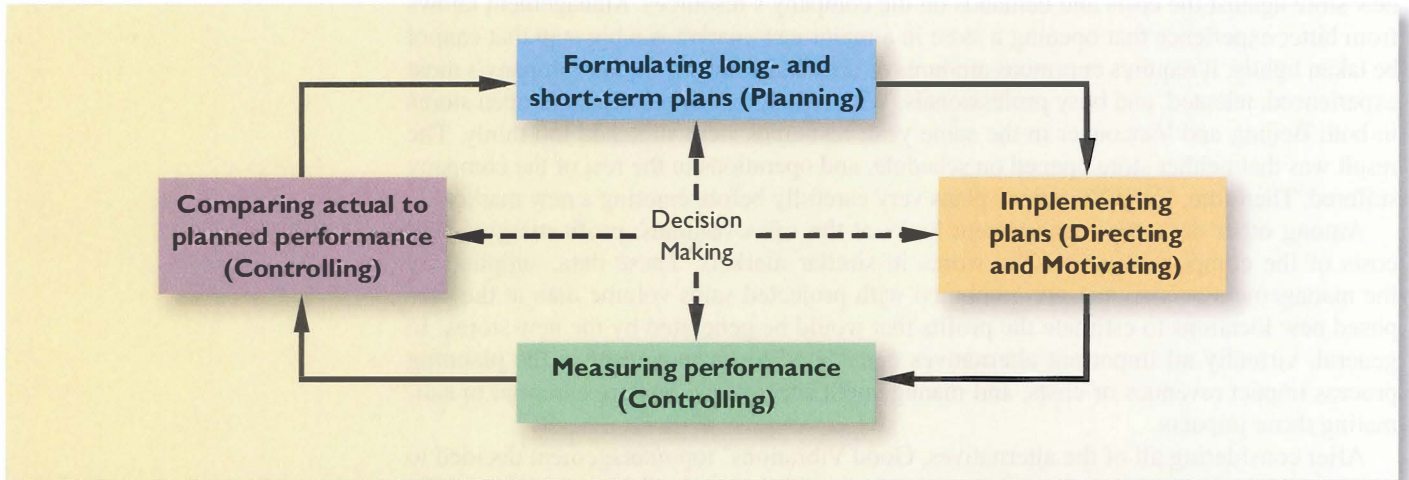
As in the case of the Personnel Department, the plans of management are often expressed formally in **budgets**, and the term *budgeting* is generally used to describe this part of the planning process. Budgets are usually prepared under the direction of the **controller**, who is the manager in charge of the Accounting Department. Typically, budgets are prepared annually and represent management's plans in specific, quantitative terms. In addition to a travel budget, the Personnel Department will be given goals in terms of new hires, courses taught, and detailed breakdowns of expected expenses. Similarly, the store managers will be given targets for sales volume, profit, expenses, pilferage losses, and employee training. Good Vibrations' management accountants will collect, analyze, and summarize these data in the form of budgets.

Directing and Motivating

In addition to planning for the future, managers oversee day-to-day activities and try to keep the organization functioning smoothly. This requires motivating and directing people. Managers assign tasks to employees, arbitrate disputes, answer questions, solve on-the-spot problems, and make many small decisions that affect customers and employees. In effect, directing is that part of a manager's job that deals with the routine and the here and now. Managerial accounting data, such as daily sales reports, are often used in this type of day-to-day activity.

Controlling

In carrying out the **control** function, managers seek to ensure that the plan is being followed. **Feedback**, which signals whether operations are on track, is the key to effective control. In sophisticated organizations, this feedback is provided by various detailed reports. One of these reports, which compares budgeted to actual results, is called a **performance report**. Performance reports suggest where operations are not proceeding as planned and where some parts of the organization may require additional attention. For example, the manager of the new Shanghai store will be given sales volume, profit, and expense targets. As the year progresses, performance reports will be constructed that compare actual sales volume, profit, and expenses to the targets. If the actual results fall below the targets, top management will be alerted that the Shanghai store requires more attention. Experienced personnel can be flown in to help the new manager, or top management may conclude that

EXHIBIT 1-1 The Planning and Control Cycle

its plans need to be revised. As we shall see in later chapters, one of the central purposes of managerial accounting is to provide this kind of feedback to managers.

The End Results of Managers' Activities

When a customer enters a Good Vibrations store, the results of management's planning, directing and motivating, and controlling activities will be evident in the many details that make the difference between a pleasant and an irritating shopping experience. The store will be clean, fashionably decorated, and logically laid out. Featured artists' videos will be displayed on TV monitors throughout the store, and the background rock music will be loud enough to send older patrons scurrying for the classical music section. Popular CDs will be in stock, and the latest hits will be available for private listening on earphones. Specific titles will be easy to find. Regional music, such as CantoPop in Hong Kong, will be prominently featured. Checkout clerks will be alert, friendly, and efficient. In short, what the customer experiences doesn't simply happen; it is the result of the efforts of managers who must visualize and then fit together the processes that are needed to get the job done.

The Planning and Control Cycle

Exhibit 1-1 depicts the work of management in the form of the *planning and control cycle*. The **planning and control cycle** involves the smooth flow of management activities from planning through directing and motivating, controlling, and then back to planning again. All of these activities involve decision making, which is the hub around which the other activities revolve.

COMPARISON OF FINANCIAL AND MANAGERIAL ACCOUNTING

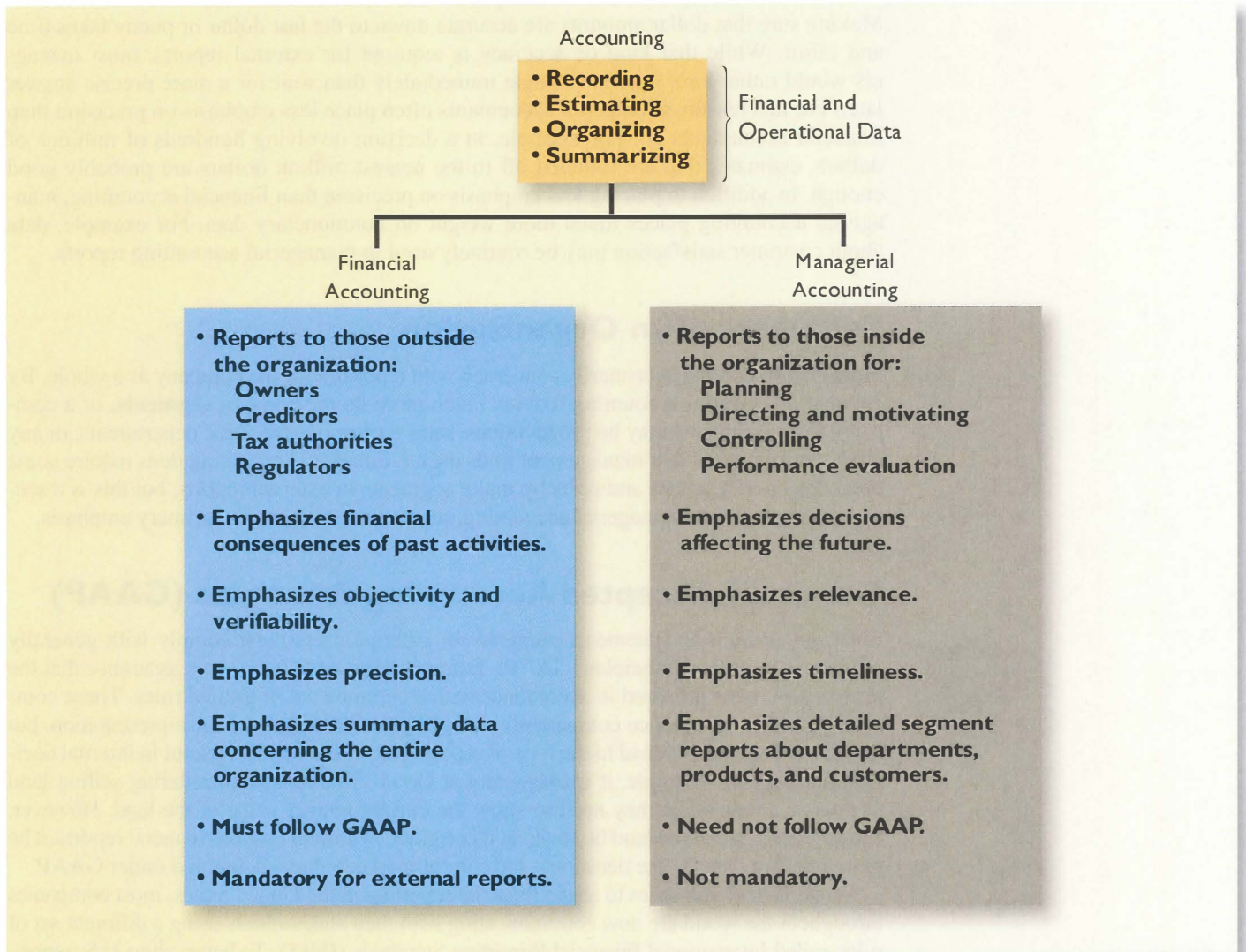
LEARNING OBJECTIVE 1

Identify the major differences and similarities between financial and managerial accounting.

Managerial accounting is concerned with providing information to managers—that is, the people inside an organization who direct and control its operations. In contrast, **financial accounting** is concerned with providing information to stockholders, creditors, and others who are outside the organization. This contrast in orientation results in a number of major differences between financial and managerial accounting, even though they often rely on the same underlying financial data. Exhibit 1-2 summarizes these differences.

As shown in Exhibit 1-2, financial and managerial accounting differ not only in their user orientation but also in their emphasis on the past and the future, in the type of data provided to users, and in several other ways. These differences are discussed in the following paragraphs.

EXHIBIT 1-2 Comparison of Financial and Managerial Accounting



Emphasis on the Future

Because *planning* is such an important part of the manager’s job, managerial accounting has a strong future orientation. In contrast, financial accounting primarily summarizes past financial transactions. These summaries may be useful in planning, but only to a point. The future is not simply a reflection of what has happened in the past. Changes are constantly taking place in economic conditions, customer needs and desires, competitive conditions, and so on. All of these changes demand that the manager’s planning be based in large part on estimates of what will happen rather than on summaries of what has already happened.



Relevance of Data

Financial accounting data should be objective and verifiable. However, for internal uses managers need information that is relevant even if it is not completely objective or verifiable. By relevant, we mean *appropriate for the problem at hand*. For example, it is difficult to verify what the sales volume is going to be for a proposed new store at Good Vibrations, but this is exactly the type of information that is most useful to managers. Managerial accounting should be flexible enough to provide whatever data are relevant for a particular decision.

Less Emphasis on Precision

Making sure that dollar amounts are accurate down to the last dollar or penny takes time and effort. While that kind of accuracy is required for external reports, most managers would rather have a good estimate immediately than wait for a more precise answer later. For this reason, managerial accountants often place less emphasis on precision than financial accountants do. For example, in a decision involving hundreds of millions of dollars, estimates that are rounded off to the nearest million dollars are probably good enough. In addition to placing less emphasis on precision than financial accounting, managerial accounting places much more weight on nonmonetary data. For example, data about customer satisfaction may be routinely used in managerial accounting reports.

Segments of an Organization

Financial accounting is primarily concerned with reporting for the company as a whole. By contrast, managerial accounting focuses much more on the parts, or **segments**, of a company. These segments may be product lines, sales territories, divisions, departments, or any other categorization that management finds useful. Financial accounting does require some breakdowns of revenues and costs by major segments in external reports, but this is a secondary emphasis. In managerial accounting, segment reporting is the primary emphasis.

Generally Accepted Accounting Principles (GAAP)



Financial accounting statements prepared for external users must comply with generally accepted accounting principles (GAAP). External users must have some assurance that the reports have been prepared in accordance with a common set of ground rules. These common ground rules enhance comparability and help reduce fraud and misrepresentation, but they do not necessarily lead to the type of reports that would be most useful in internal decision making. For example, if management at Good Vibrations is considering selling land to finance a new store, they need to know the current market value of the land. However, GAAP requires that the land be stated at its original, historical cost on financial reports. The more relevant data for the decision—the current market value—is ignored under GAAP.

While GAAP continues to shape financial reporting in the United States, most companies throughout the world are now communicating with their stakeholders using a different set of rules called International Financial Reporting Standards (IFRS). To better align U.S. reporting standards with the global community, the Securities and Exchange Commission (SEC) may eventually require all publicly traded companies in the U.S. to comply with IFRS instead of GAAP.¹ Regardless of what the SEC decides to do, it is important to understand that managerial accounting is not bound by GAAP or IFRS. Managers set their own rules concerning the content and form of internal reports. The only constraint is that the expected benefits from using the information should outweigh the costs of collecting, analyzing, and summarizing the data. Nevertheless, as we shall see in subsequent chapters, it is undeniably true that financial reporting requirements have heavily influenced management accounting practice.

Managerial Accounting—Not Mandatory

Financial accounting is mandatory; that is, it must be done. Various outside parties such as the Securities and Exchange Commission (SEC) and the tax authorities require periodic financial statements. Managerial accounting, on the other hand, is not mandatory. A company is completely free to do as much or as little as it wishes. No regulatory bodies or other outside agencies specify what is to be done, or, for that matter, whether anything

¹The SEC may permit some companies in industries composed mainly of IFRS-reporting entities to adopt IFRS for calendar years ending on or after December 15, 2009. If the SEC decides to mandate IFRS for all publicly traded companies, then the three-year transitional process will begin in 2014.

is to be done at all. Because managerial accounting is completely optional, the important question is always, “Is the information useful?” rather than, “Is the information required?”

As explained earlier, the work of management focuses on planning, which includes setting objectives and outlining how to attain these objectives, and control, which includes the steps taken to ensure that objectives are realized. To carry out these planning and control responsibilities, managers need *information* about the organization. From an accounting point of view, this information often relates to the *costs* of the organization. In managerial accounting, the term *cost* is used in many different ways. The reason is that there are many types of costs, and these costs are classified differently according to the immediate needs of management. For example, managers may want cost data to prepare external financial reports, to prepare planning budgets, or to make decisions. Each different use of cost data may demand a different kind of cost. For example, historical cost data is used to prepare external financial reports whereas decision making may require current cost data.

GENERAL COST CLASSIFICATIONS

We have chosen to start our discussion of cost concepts by focusing on manufacturing companies, because they are involved in most of the activities found in other types of organizations. Manufacturing companies such as **Texas Instruments**, **Ford**, and **DuPont** are involved in acquiring raw materials, producing finished goods, marketing, distributing, billing, and almost every other business activity. Therefore, an understanding of costs in a manufacturing company can be very helpful in understanding costs in other types of organizations.

In this chapter, we introduce cost concepts that apply to diverse organizations including fast-food outlets such as **Kentucky Fried Chicken**, **Pizza Hut**, and **Taco Bell**; movie studios such as **Disney**, **Paramount**, and **United Artists**; consulting firms such as **Accenture** and **McKinsey**; and your local hospital. The exact terms used in these industries may not be the same as those used in manufacturing, but the same basic concepts apply. With some slight modifications, these basic concepts also apply to merchandising companies such as **Wal-Mart**, **The Gap**, **7-Eleven**, and **Nordstrom**. With that in mind, let’s begin our discussion of manufacturing costs.

Manufacturing Costs

Most manufacturing companies separate manufacturing costs into three broad categories: direct materials, direct labor, and manufacturing overhead. A discussion of each of these categories follows.

Direct Materials The materials that go into the final product are called **raw materials**. This term is somewhat misleading because it seems to imply unprocessed natural resources like wood pulp or iron ore. Actually, raw materials refer to any materials that are used in the final product; and the finished product of one company can become the raw materials of another company. For example, the plastics produced by **Du Pont** are a raw material used by **Compaq Computer** in its personal computers. One study of 37 manufacturing industries found that materials costs averaged about 55% of sales revenues.²

Raw materials may include both *direct* and *indirect materials*. **Direct materials** are those materials that become an integral part of the finished product and whose costs can be conveniently traced to the finished product. This would include, for example, the seats that **Airbus** purchases from subcontractors to install in its commercial aircraft and the tiny electric motor **Panasonic** uses in its DVD players.

Sometimes it isn’t worth the effort to trace the costs of relatively insignificant materials to end products. Such minor items would include the solder used to make electrical connections in a **Sony** TV or the glue used to assemble an **Ethan Allen** chair.

²Germain Boer and Debra Jeter, “What’s New About Modern Manufacturing? Empirical Evidence on Manufacturing Cost Changes,” *Journal of Management Accounting Research*, volume 5, pp. 61–83.



LEARNING OBJECTIVE 2

Identify and give examples of each of the three basic manufacturing cost categories.



Materials such as solder and glue are called **indirect materials** and are included as part of manufacturing overhead, which is discussed later in this section.

Direct Labor **Direct labor** consists of labor costs that can be easily (i.e., physically and conveniently) traced to individual units of product. Direct labor is sometimes called *touch labor* because direct labor workers typically touch the product while it is being made. Examples of direct labor include assembly-line workers at **Toyota**, carpenters at the home builder **Kaufman and Broad**, and electricians who install equipment on aircraft at **Bombardier Learjet**.

Labor costs that cannot be physically traced to particular products, or that can be traced only at great cost and inconvenience, are termed **indirect labor**. Just like indirect materials, indirect labor is treated as part of manufacturing overhead. Indirect labor includes the labor costs of janitors, supervisors, materials handlers, and night security guards. Although the efforts of these workers are essential, it would be either impractical or impossible to accurately trace their costs to specific units of product. Hence, such labor costs are treated as indirect labor.

IN BUSINESS

Is Sending Jobs Overseas Always a Good Idea?

In recent years, many companies have sent jobs from high labor-cost countries such as the United States to lower labor-cost countries such as India and China. But is chasing labor cost savings always the right thing to do? In manufacturing, the answer is no. Typically, total direct labor costs are around 7% to 15% of cost of goods sold. Because direct labor is such a small part of overall costs, the labor savings realized by “offshoring” jobs can easily be overshadowed by a decline in supply chain efficiency that occurs simply because production facilities are located farther from the ultimate customers. The increase in inventory carrying costs and obsolescence costs coupled with slower response to customer orders, not to mention foreign currency exchange risks, can more than offset the benefits of employing geographically dispersed low-cost labor.

One manufacturer of casual wear in Los Angeles, California, understands the value of keeping jobs close to home in order to maintain a tightly knit supply chain. The company can fill orders for as many as 160,000 units in 24 hours. In fact, the company carries less than 30 days’ inventory and is considering fabricating clothing only after orders are received from customers rather than attempting to forecast what items will sell and making them in advance. How would they do this? The company’s entire supply chain—including weaving, dyeing, and sewing—is located in downtown Los Angeles, eliminating shipping delays.

Source: Robert Sternfels and Ronald Ritter, “When Offshoring Doesn’t Make Sense,” *The Wall Street Journal*, October 19, 2004, p. B8.

Major shifts have taken place and continue to take place in the structure of labor costs in some industries. Sophisticated automated equipment, run and maintained by skilled indirect workers, is increasingly replacing direct labor. Indeed, direct labor averages only about 10% of sales revenues in manufacturing. In some companies, direct labor has become such a minor element of cost that it has disappeared altogether as a separate cost category. Nevertheless, the vast majority of manufacturing and service companies throughout the world continue to recognize direct labor as a separate cost category.

Manufacturing Overhead **Manufacturing overhead**, the third element of manufacturing cost, includes all manufacturing costs except direct materials and direct labor. Manufacturing overhead includes items such as indirect materials; indirect labor; maintenance and repairs on production equipment; and heat and light, property taxes, depreciation, and insurance on manufacturing facilities. A company also incurs costs for heat and light, property taxes, insurance, depreciation, and so forth, associated with its selling and administrative functions, but these costs are not included as part

of manufacturing overhead. Only those costs associated with *operating the factory* are included in manufacturing overhead. Across large numbers of manufacturing companies, manufacturing overhead averages about 16% of sales revenues.³

Various names are used for manufacturing overhead, such as *indirect manufacturing cost*, *factory overhead*, and *factory burden*. All of these terms are synonyms for *manufacturing overhead*.

Nonmanufacturing Costs

Nonmanufacturing costs are often divided into two categories: (1) *selling costs* and (2) *administrative costs*. **Selling costs** include all costs that are incurred to secure customer orders and get the finished product to the customer. These costs are sometimes called *order-getting* and *order-filling costs*. Examples of selling costs include advertising, shipping, sales travel, sales commissions, sales salaries, and costs of finished goods warehouses.

Administrative costs include all costs associated with the *general management* of an organization rather than with manufacturing or selling. Examples of administrative costs include executive compensation, general accounting, secretarial, public relations, and similar costs involved in the overall, general administration of the organization *as a whole*.

Nonmanufacturing costs are also often called selling, general, and administrative (SG&A) costs or just selling and administrative costs.

PRODUCT COSTS VERSUS PERIOD COSTS

In addition to classifying costs as manufacturing or nonmanufacturing costs, there are other ways to look at costs. For instance, they can also be classified as either *product costs* or *period costs*. To understand the difference between product costs and period costs, we must first discuss the matching principle from financial accounting.

Generally, costs are recognized as expenses on the income statement in the period that benefits from the cost. For example, if a company pays for liability insurance in advance for two years, the entire amount is not considered an expense of the year in which the payment is made. Instead, one-half of the cost would be recognized as an expense each year. The reason is that both years—not just the first year—benefit from the insurance payment. The unexpensed portion of the insurance payment is carried on the balance sheet as an asset called prepaid insurance.

The *matching principle* is based on the *accrual* concept that *costs incurred to generate a particular revenue should be recognized as expenses in the same period that the revenue is recognized*. This means that if a cost is incurred to acquire or make something that will eventually be sold, then the cost should be recognized as an expense only when the sale takes place—that is, when the benefit occurs. Such costs are called *product costs*.

Product Costs

For financial accounting purposes, **product costs** include all costs involved in acquiring or making a product. In the case of manufactured goods, these costs consist of direct materials, direct labor, and manufacturing overhead. Product costs “attach” to units of product as the goods are purchased or manufactured, and they remain attached as the goods go into inventory awaiting sale. Product costs are initially assigned to an inventory account on the balance sheet. When the goods are sold, the costs are released from inventory as expenses (typically called cost of goods sold) and matched against sales revenue. Because product costs are initially assigned to inventories, they are also known as **inventoriable costs**.

LEARNING OBJECTIVE 3

Distinguish between product costs and period costs and give examples of each.



³J. Miller, A. DeMeyer, and J. Nakane, *Benchmarking Global Manufacturing* (Homewood, IL: Richard D. Irwin), Chapter 2. The Boer and Jeter article cited earlier contains a similar finding concerning the magnitude of manufacturing overhead.

We want to emphasize that product costs are not necessarily treated as expenses in the period in which they are incurred. Rather, as explained above, they are treated as expenses in the period in which the related products *are sold*. This means that a product cost such as direct materials or direct labor might be incurred during one period but not recorded as an expense until a following period when the completed product is sold.

Period Costs

Period costs are all the costs that are not product costs. For example, sales commissions and the rental costs of administrative offices are period costs. Period costs are not included as part of the cost of either purchased or manufactured goods; instead, period costs are expensed on the income statement in the period in which they are incurred using the usual rules of accrual accounting. Keep in mind that the period in which a cost is incurred is not necessarily the period in which cash changes hands. For example, as discussed earlier, the costs of liability insurance are spread across the periods that benefit from the insurance—regardless of the period in which the insurance premium is paid.

As suggested above, *all selling and administrative expenses are considered to be period costs*. Advertising, executive salaries, sales commissions, public relations, and other non-manufacturing costs discussed earlier are all examples of period costs. They will appear on the income statement as expenses in the period in which they are incurred.

Prime Cost and Conversion Cost

Two more cost categories are often used in discussions of manufacturing costs—*prime cost* and *conversion cost*. **Prime cost** is the sum of direct materials cost and direct labor cost. **Conversion cost** is the sum of direct labor cost and manufacturing overhead cost. The term *conversion cost* is used to describe direct labor and manufacturing overhead because these costs are incurred to convert materials into the finished product.

Exhibit 1–3 contains a summary of the cost terms that we have introduced so far.

IN BUSINESS

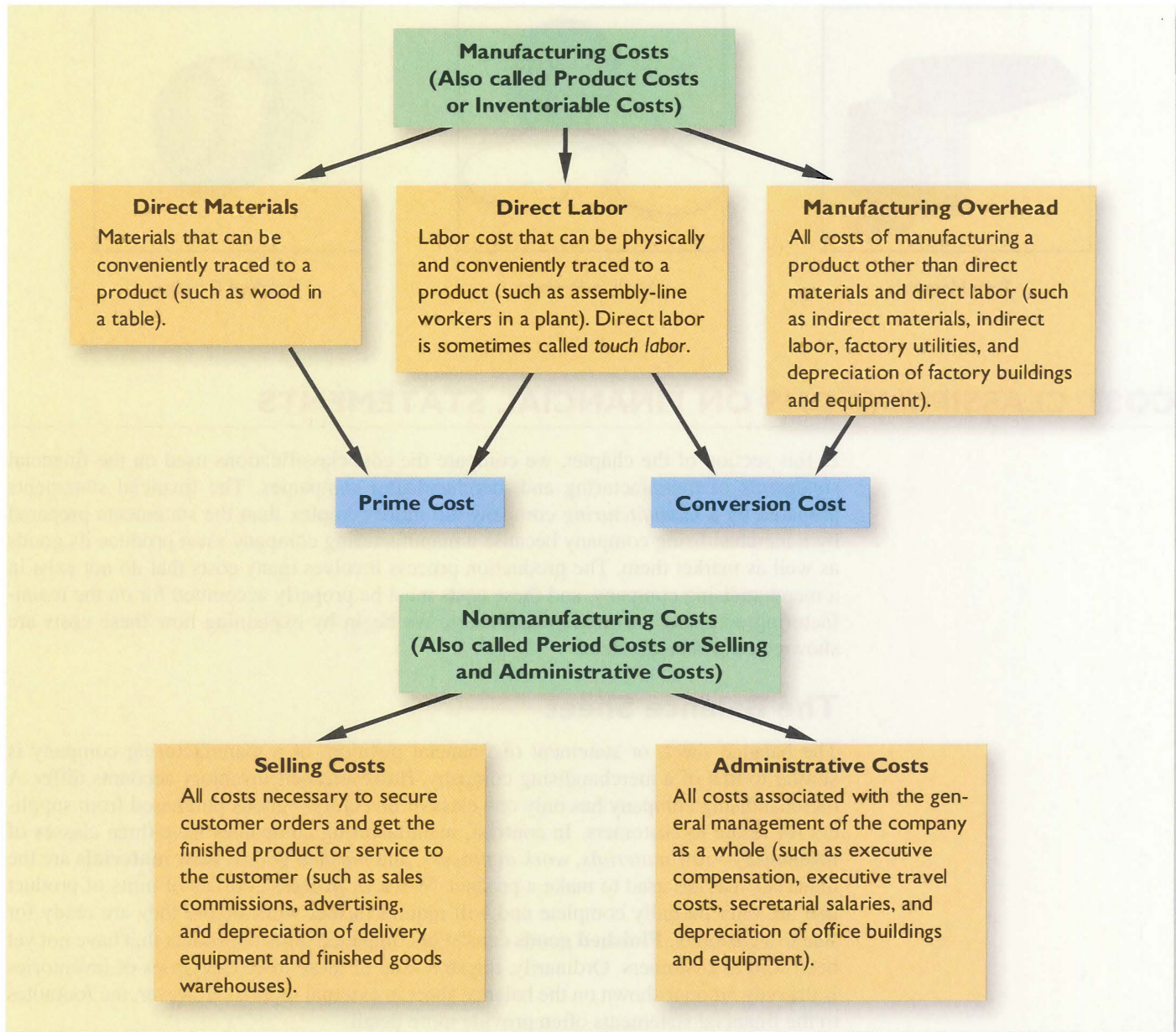
Product Costs and Period Costs: A Look across Industries

Cost of goods sold and selling and administrative expenses expressed as a percentage of sales differ across companies and industries. For example, the data below summarize the median cost of goods sold as a percentage of sales and the median selling and administrative expense as a percentage of sales for eight different industries. Why do you think the percentages in each column differ so dramatically?

Industry	Cost of Goods Sold ÷ Sales	Selling and Administrative Expense ÷ Sales
Aerospace and Defense	79%	9%
Beverages.....	52%	34%
Computer Software and Services	34%	38%
Electrical Equipment and Components.....	64%	21%
Healthcare Services.....	82%	6%
Oil and Gas.....	90%	3%
Pharmaceuticals	31%	41%
Restaurants.....	78%	8%

Source: Lori Calabro, "Controlling the Flow," *CFO*, February 2005, p. 46–50.

EXHIBIT 1-3 Summary of Cost Terms



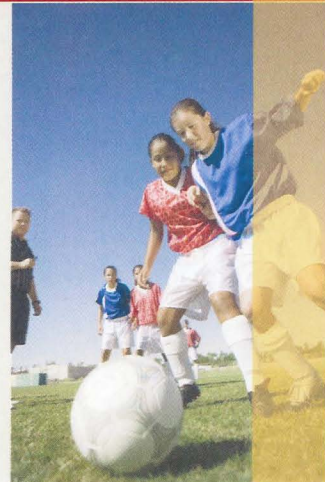
The Challenges of Managing Charitable Organizations

IN BUSINESS

Charitable organizations, such as **Harlem Children's Zone**, **Sports4Kids**, and **Citizen Schools**, are facing a difficult situation. Many donors—aware of stories involving charities that spent excessively on themselves while losing sight of their mission—have started prohibiting their charity of choice from using donated funds to pay for administrative costs. However, even the most efficient charitable organizations find it difficult to expand without making additions to their infrastructure. For example, Sports4Kids' nationwide expansion of its sports programs drove up administrative costs from 5.6% to 14.7% of its total budget. The organization claims that this cost increase was necessary to build a more experienced management team to oversee the dramatically increased scale of operations.

Many charitable organizations are starting to seek gifts explicitly to fund administrative expenses. Their argument is simple—they cannot do good deeds for other people without incurring such costs.

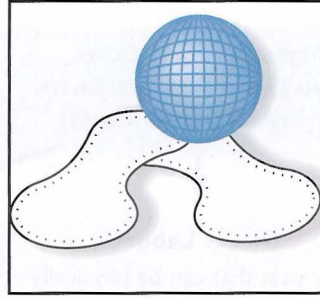
Source: Rachel Emma Silverman and Sally Beatty, "Save the Children (But Pay the Bills, Too)," *The Wall Street Journal*, December 26, 2006, pp. D1–D2.



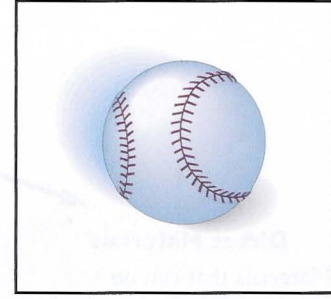
Manufacturing Companies: Classifications of Inventory



Raw Materials



Work in Process



Finished Goods

COST CLASSIFICATIONS ON FINANCIAL STATEMENTS

In this section of the chapter, we compare the cost classifications used on the financial statements of manufacturing and merchandising companies. The financial statements prepared by a *manufacturing* company are more complex than the statements prepared by a merchandising company because a manufacturing company must produce its goods as well as market them. The production process involves many costs that do not exist in a merchandising company, and these costs must be properly accounted for on the manufacturing company's financial statements. We begin by explaining how these costs are shown on the balance sheet.

The Balance Sheet

The balance sheet, or statement of financial position, of a manufacturing company is similar to that of a merchandising company. However, their inventory accounts differ. A merchandising company has only one class of inventory—goods purchased from suppliers for resale to customers. In contrast, manufacturing companies have three classes of inventories—*raw materials*, *work in process*, and *finished goods*. **Raw materials** are the materials that are used to make a product. **Work in process** consists of units of product that are only partially complete and will require further work before they are ready for sale to a customer. **Finished goods** consist of completed units of product that have not yet been sold to customers. Ordinarily, the sum total of these three categories of inventories is the only amount shown on the balance sheet in external reports. However, the footnotes to the financial statements often provide more detail.

We will use two companies—Graham Manufacturing and Reston Bookstore—to illustrate the concepts discussed in this section. Graham Manufacturing is located in Portsmouth, New Hampshire, and makes precision brass fittings for yachts. Reston Bookstore is a small bookstore in Reston, Virginia, specializing in books about the Civil War.

The footnotes to Graham Manufacturing's Annual Report reveal the following information concerning its inventories:

Graham Manufacturing Corporation Inventory Accounts		
	Beginning Balance	Ending Balance
Raw materials	\$ 60,000	\$ 50,000
Work in process	90,000	60,000
Finished goods.....	<u>125,000</u>	<u>175,000</u>
Total inventory accounts.....	<u>\$275,000</u>	<u>\$285,000</u>

Graham Manufacturing’s raw materials inventory consists largely of brass rods and brass blocks. The work in process inventory consists of partially completed brass fittings. The finished goods inventory consists of brass fittings that are ready to be sold to customers.

In contrast, the inventory account at Reston Bookstore consists entirely of the costs of books the company has purchased from publishers for resale to the public. In merchandising companies like Reston, these inventories may be called *merchandise inventory*. The beginning and ending balances in this account appear as follows:

Reston Bookstore Inventory Account		
	Beginning Balance	Ending Balance
Merchandise inventory.....	<u>\$100,000</u>	<u>\$150,000</u>

The Income Statement

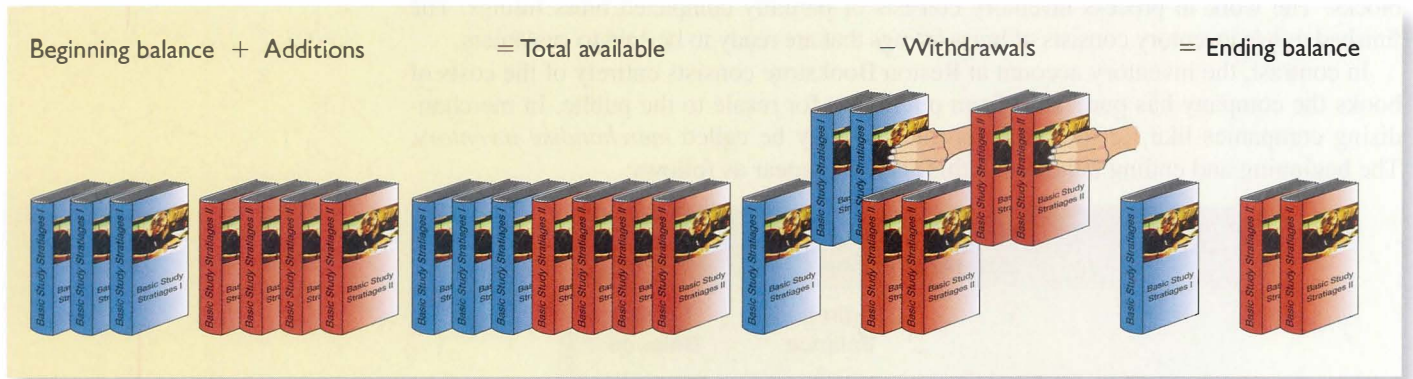
Exhibit 1–4 compares the income statements of Reston Bookstore and Graham Manufacturing. For purposes of illustration, these statements contain more detail about cost of goods sold than you will generally find in published financial statements.

LEARNING OBJECTIVE 4

Prepare an income statement including calculation of the cost of goods sold.

EXHIBIT 1-4 Comparative Income Statements: Merchandising and Manufacturing Companies

		Merchandising Company Reston Bookstore			
The cost of merchandise inventory purchased from outside suppliers during the period.	}	→	Sales.....		\$1,000,000
			Cost of goods sold:		
			Beginning merchandise inventory.....	\$100,000	
			Add: Purchases.....	<u>650,000</u>	
			Goods available for sale.....	750,000	
			Deduct: Ending merchandise inventory.....	<u>150,000</u>	<u>600,000</u>
			Gross margin.....		400,000
			Selling and administrative expenses:		
			Selling expense.....	100,000	
			Administrative expense.....	<u>200,000</u>	<u>300,000</u>
Net operating income.....		<u>\$ 100,000</u>			
		Manufacturing Company Graham Manufacturing			
The manufacturing costs associated with the goods that were finished during the period. (See Exhibit 1–6 for details.)	}	→	Sales.....		\$1,500,000
			Cost of goods sold:*		
			Beginning finished goods inventory.....	\$125,000	
			Add: Cost of goods manufactured.....	<u>850,000</u>	
			Goods available for sale.....	975,000	
			Deduct: Ending finished goods inventory.....	<u>175,000</u>	<u>800,000</u>
			Gross margin.....		700,000
			Selling and administrative expenses:		
			Selling expense.....	250,000	
			Administrative expense.....	<u>300,000</u>	<u>550,000</u>
Net operating income.....		<u>\$ 150,000</u>			
*Further adjustments will be made to the cost of goods sold for a manufacturing company in the next chapter.					

EXHIBIT 1-5 Inventory Flows

At first glance, the income statements of merchandising and manufacturing companies like Reston Bookstore and Graham Manufacturing are very similar. The only apparent difference is in the labels of some of the entries in the computation of the cost of goods sold. In the exhibit, the computation of cost of goods sold relies on the following basic equation for inventory accounts:

Basic Equation for Inventory Accounts

$$\begin{array}{r} \text{Beginning} \\ \text{balance} \end{array} + \begin{array}{r} \text{Additions} \\ \text{to inventory} \end{array} = \begin{array}{r} \text{Ending} \\ \text{balance} \end{array} + \begin{array}{r} \text{Withdrawals} \\ \text{from inventory} \end{array}$$

The logic underlying this equation, which applies to any inventory account, is illustrated in Exhibit 1-5. The beginning inventory consists of any units that are in the inventory at the beginning of the period. Additions are made to the inventory during the period. The sum of the beginning balance and the additions to the account is the total amount of inventory available. During the period, withdrawals are made from inventory. The ending balance is whatever is left at the end of the period after the withdrawals.

These concepts are used to determine the cost of goods sold for a merchandising company like Reston Bookstore as follows:

Cost of Goods Sold in a Merchandising Company

$$\begin{array}{r} \text{Beginning} \\ \text{merchandise} \\ \text{inventory} \end{array} + \text{Purchases} = \begin{array}{r} \text{Ending} \\ \text{merchandise} \\ \text{inventory} \end{array} + \text{Cost of goods sold}$$

or

$$\text{Cost of goods sold} = \begin{array}{r} \text{Beginning} \\ \text{merchandise} \\ \text{inventory} \end{array} + \text{Purchases} - \begin{array}{r} \text{Ending} \\ \text{merchandise} \\ \text{inventory} \end{array}$$

To determine the cost of goods sold in a merchandising company, we only need to know the beginning and ending balances in the Merchandise Inventory account and the purchases. Total purchases can be easily determined in a merchandising company by simply adding together all purchases from suppliers.

EXHIBIT 1-6 Schedule of Cost of Goods Manufactured

Direct materials:			
Beginning raw materials inventory*	\$ 60,000		
Add: Purchases of raw materials	400,000		
Raw materials available for use	460,000		
Deduct: Ending raw materials inventory	50,000		
Raw materials used in production		\$410,000	← Direct materials
Direct labor		60,000	← Direct labor
Manufacturing overhead		350,000	← Manufacturing overhead
Total manufacturing cost		820,000	
Add: Beginning work in process inventory		90,000	
		910,000	
Deduct: Ending work in process inventory		60,000	
Cost of goods manufactured (see Exhibit 1-4)		<u>\$850,000</u>	← Cost of goods manufactured

*We assume in this example that the Raw Materials inventory account contains only direct materials.

to miss. Some of the materials, direct labor, and manufacturing overhead costs incurred during the period relate to goods that are not yet completed. As stated above, the cost of goods manufactured consists of the manufacturing costs associated with the goods that were finished during the period. Consequently, adjustments need to be made to the total manufacturing cost of the period for the partially completed goods that were in process at the beginning and at the end of the period. The costs that relate to goods that are not yet completed are shown in the work in process inventory figures at the bottom of the schedule. Note that the beginning work in process inventory must be added to the manufacturing costs of the period, and the ending work in process inventory must be deducted, to arrive at the cost of goods manufactured. The \$30,000 decline in the Work in Process account during the year (\$90,000 – \$60,000) explains the \$30,000 difference between the total manufacturing cost and the cost of goods manufactured.

PRODUCT COST FLOWS

Earlier in the chapter, we defined product costs as costs incurred to either purchase or manufacture goods. For manufactured goods, these costs consist of direct materials, direct labor, and manufacturing overhead. It will be helpful at this point to look briefly at the flow of costs in a manufacturing company. This will help us understand how product costs move through the various accounts and how they affect the balance sheet and the income statement.

EXHIBIT 1-7 Cost Flows and Classifications in a Manufacturing Company

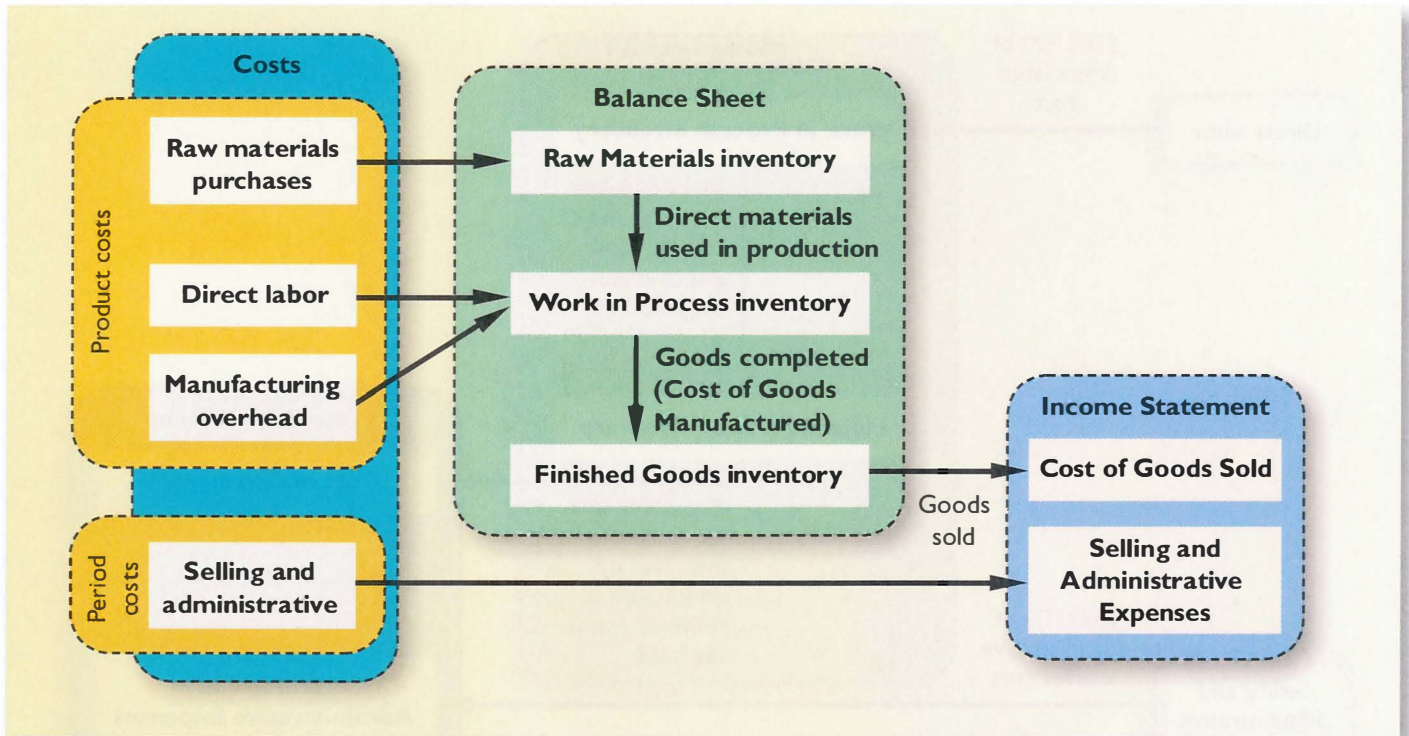
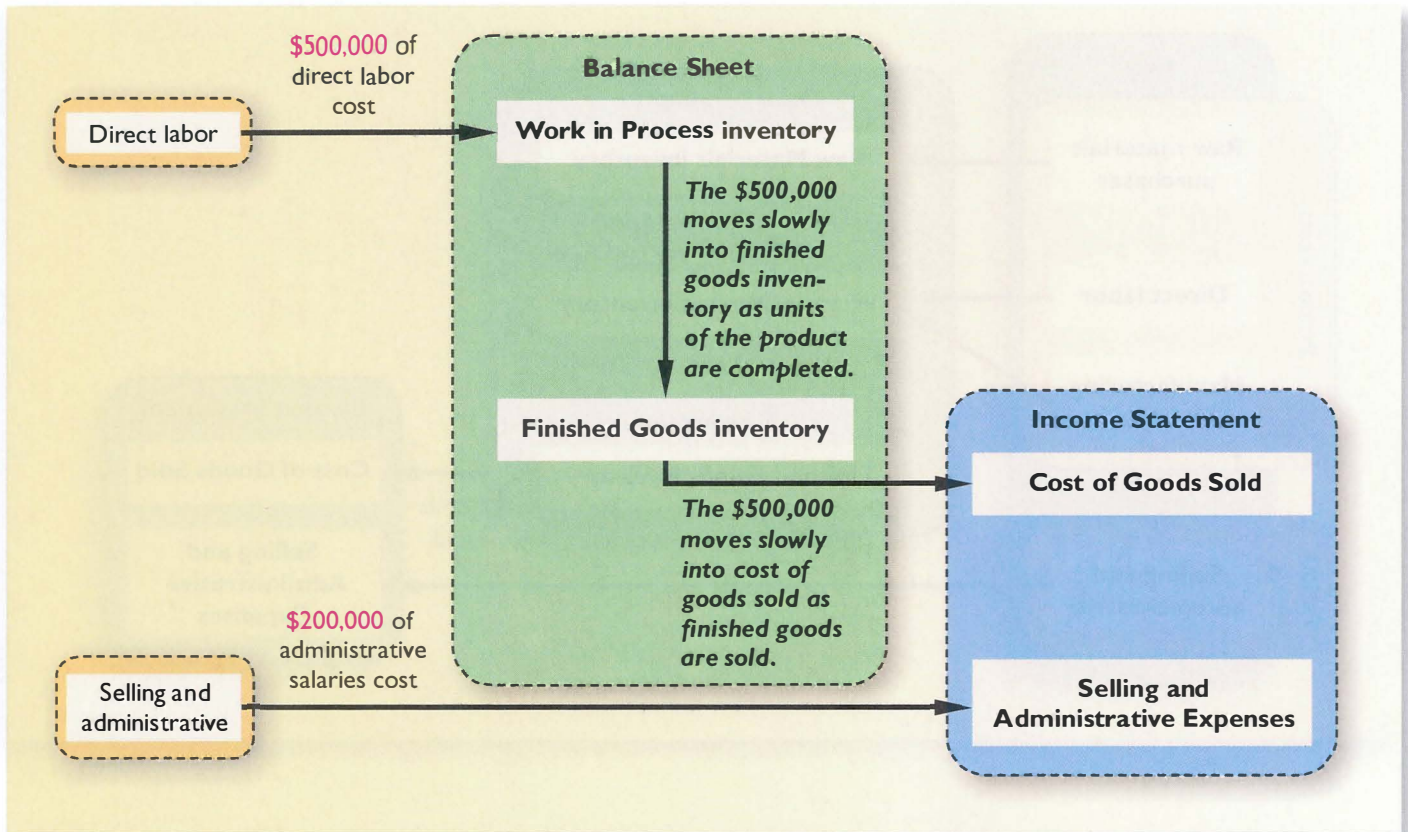


Exhibit 1-7 illustrates the flow of costs in a manufacturing company. Raw materials purchases are recorded in the Raw Materials inventory account. When raw materials are used in production, their costs are transferred to the Work in Process inventory account as direct materials. Notice that direct labor cost and manufacturing overhead cost are added directly to Work in Process. Work in Process can be viewed most simply as products on an assembly line. The direct materials, direct labor, and manufacturing overhead costs added to Work in Process in Exhibit 1-7 are the costs needed to complete these products as they move along this assembly line.

Notice from the exhibit that as goods are completed, their costs are transferred from Work in Process to Finished Goods. Here the goods await sale to customers. As goods are sold, their costs are transferred from Finished Goods to Cost of Goods Sold. At this point the various costs required to make the product are finally recorded as an expense. Until that point, these costs are in inventory accounts on the balance sheet.

Inventoriable Costs

As stated earlier, product costs are often called inventoriable costs. The reason is that these costs go directly into inventory accounts as they are incurred (first into Work in Process and then into Finished Goods), rather than going into expense accounts. Thus, they are termed *inventoriable costs*. *This is a key concept because such costs can end up on the balance sheet as assets if goods are only partially completed or are unsold at the end of a period.* To illustrate this point, refer again to Exhibit 1-7. At the end of the period, the materials, labor, and overhead costs that are associated with the units in the Work in Process and Finished Goods inventory accounts will appear on the balance sheet as assets. As explained earlier, these costs will not become expenses until the goods are completed and sold.

EXHIBIT 1-8 An Example of Cost Flows in a Manufacturing Company

Selling and administrative expenses are not involved in making a product. For this reason, they are not treated as product costs but rather as period costs that are expensed as they are incurred, as shown in Exhibit 1-7.

An Example of Cost Flows

To provide an example of cost flows in a manufacturing company, assume that a company's direct labor cost is \$500,000 and its administrative salaries cost is \$200,000. As illustrated in Exhibit 1-8, the direct labor cost is added to Work in Process. As shown in the exhibit, the direct labor cost will not become an expense until the goods that are produced during the year are sold—which may not happen until the following year or even later. Until the goods are sold, the \$500,000 will be part of inventories—either Work in Process or Finished Goods—along with the other costs of producing the goods. By contrast, \$200,000 of administrative salaries cost will be expensed immediately.

Thus far, we have been mainly concerned with classifications of manufacturing costs for the purpose of determining inventory valuations on the balance sheet and cost of goods sold on the income statement in external financial reports. However, costs are used for many other purposes, and each purpose requires a different classification of costs. We will consider several different purposes for cost classifications in the remaining sections of this chapter. These purposes and the corresponding cost classifications are summarized in Exhibit 1-9. To help keep the big picture in mind, we suggest that you refer back to this exhibit frequently as you progress through the rest of this chapter.

EXHIBIT 1-9
 Summary of Cost Classifications

Purpose of Cost Classification	Cost Classifications
Preparing external financial statements	<ul style="list-style-type: none"> • Product costs (inventoriable) <ul style="list-style-type: none"> • Direct materials • Direct labor • Manufacturing overhead • Period costs (expensed) <ul style="list-style-type: none"> • Nonmanufacturing costs <ul style="list-style-type: none"> • Selling costs • Administrative costs
Predicting cost behavior in response to changes in activity	<ul style="list-style-type: none"> • Variable cost (proportional to activity) • Fixed cost (constant in total)
Assigning costs to cost objects such as departments or products	<ul style="list-style-type: none"> • Direct cost (can be easily traced) • Indirect cost (cannot be easily traced)
Making decisions	<ul style="list-style-type: none"> • Differential cost (differs between alternatives) • Sunk cost (past cost not affected by a decision) • Opportunity cost (forgone benefit)

1. Which of the following statements is true? (You may select more than one answer.)
 - a. Conversion costs include direct materials and direct labor.
 - b. Indirect materials are included in manufacturing overhead.
 - c. Prime costs are included in manufacturing overhead.
 - d. Selling costs are considered period costs.
2. If the cost of goods sold is \$100,000 and the ending finished goods inventory is \$30,000 higher than the beginning finished goods inventory, what must be the amount of the cost of goods manufactured?
 - a. \$30,000
 - b. \$100,000
 - c. \$130,000
 - d. \$70,000



COST CLASSIFICATIONS FOR PREDICTING COST BEHAVIOR

Quite frequently, it is necessary to predict how a certain cost will behave in response to a change in activity. For example, a manager at **Qwest**, a telephone company, may want to estimate the impact a 5 percent increase in long-distance calls by customers would have on Qwest's total electric bill. **Cost behavior** refers to how a cost reacts to changes in the level of activity. As the activity level rises and falls, a particular cost may rise and fall as well—or it may remain constant. For planning purposes, a manager must be able to anticipate which of these will happen; and if a cost can be expected to change, the manager must be able to estimate how much it will change. To help make such distinctions, costs are often categorized as variable or fixed.

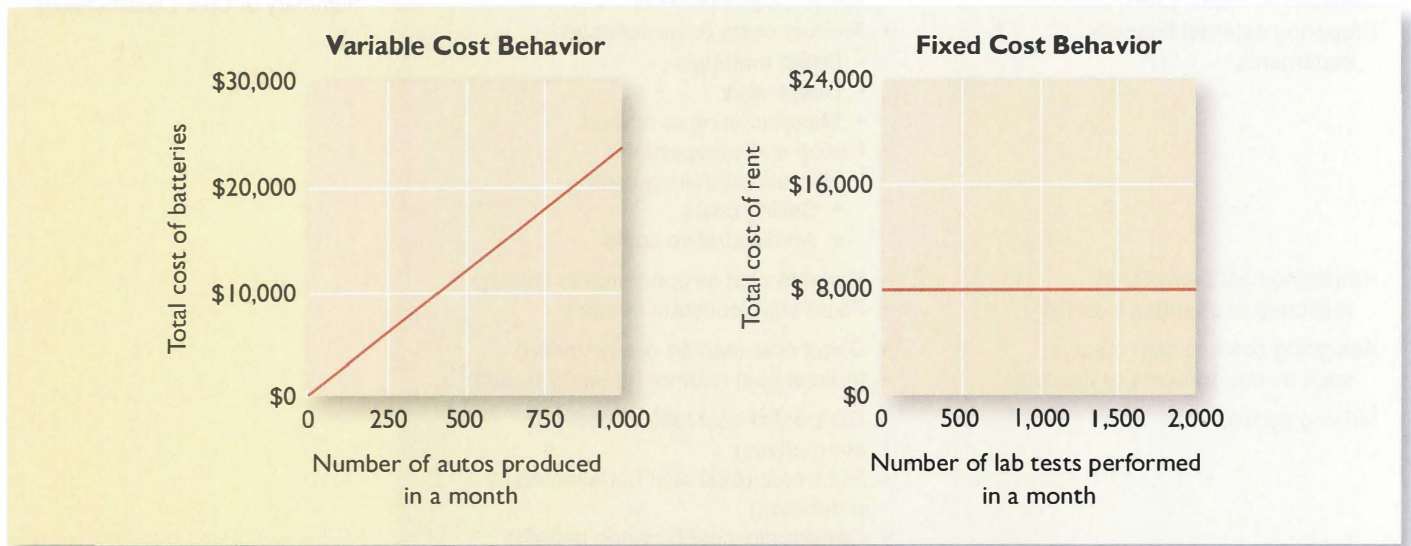
LEARNING OBJECTIVE 6

Understand the differences between variable costs and fixed costs.



Variable Cost

A **variable cost** is a cost that varies, in total, in direct proportion to changes in the level of activity. The activity can be expressed in many ways, such as units produced, units sold, miles driven, beds occupied, lines of print, hours worked, and so forth. A good example

EXHIBIT 1-10 Variable and Fixed Cost Behavior

of a variable cost is direct materials. The cost of direct materials used during a period will vary, in total, in direct proportion to the number of units that are produced. To illustrate this idea, consider the Saturn Division of **GM**. Each auto requires one battery. As the output of autos increases and decreases, the number of batteries used will increase and decrease proportionately. If auto production goes up 10%, then the number of batteries used will also go up 10%. The concept of a variable cost is shown graphically in Exhibit 1-10.

The graph on the left-hand side of Exhibit 1-10 illustrates that the *total* variable cost rises and falls as the activity level rises and falls. This idea is presented below, assuming that a Saturn's battery costs \$24:

Number of Autos Produced	Cost per Battery	Total Variable Cost—Batteries
1	\$24	\$24
500	\$24	\$12,000
1,000	\$24	\$24,000

While total variable costs change as the activity level changes, it is important to note that a variable cost is constant if expressed on a *per unit* basis. For example, the per unit cost of batteries remains constant at \$24 even though the total cost of the batteries increases and decreases with activity.

There are many examples of costs that are variable with respect to the products and services provided by a company. In a manufacturing company, variable costs include items such as direct materials, shipping costs, and sales commissions and some elements of manufacturing overhead such as lubricants. We will also usually assume that direct labor is a variable cost, although direct labor may act more like a fixed cost in some situations as we shall see in a later chapter. In a merchandising company, the variable costs of carrying and selling products include items such as cost of goods sold, sales commissions, and billing costs. In a hospital, the variable costs of providing health care services to patients would include the costs of the supplies, drugs, meals, and perhaps nursing services.

When we say that a cost is variable, we ordinarily mean that it is variable with respect to the amount of goods or services the organization produces. However, costs can be variable with respect to other things. For example, the wages paid to employees at a **Blockbuster Video** outlet will depend on the number of hours the store is open and not strictly

Brown Is Thinking Green

IN BUSINESS

United Parcel Service (UPS) truck drivers travel more than 1.3 billion miles annually to deliver more than 4.5 billion packages. Therefore, it should come as no surprise that fuel is a huge variable cost for the company. Even if UPS can shave just a penny of cost from each mile driven, the savings can be enormous. This explains why UPS is so excited about swapping its old diesel powered trucks for diesel-electric hybrid vehicles, which have the potential to cut fuel costs by 50%. Beyond the savings for UPS, the environment would also benefit from the switch because hybrid vehicles cut emissions by 90%. As UPS television commercials ask, "What can Brown do for you?" Thanks to diesel-electric technology, the answer is that Brown can help make the air you breathe a little bit cleaner.



Source: Charles Haddad and Christine Tierney, "FedEx and Brown Are Going Green," *BusinessWeek*, August 4, 2003, pp. 60–62.

on the number of videos rented. In this case, we would say that wage costs are variable with respect to the hours of operation. Nevertheless, when we say that a cost is variable, we ordinarily mean it is variable with respect to the amount of goods and services produced. This could be how many Jeep Cherokees are produced, how many videos are rented, how many patients are treated, and so on.

Fixed Cost

A **fixed cost** is a cost that remains constant, in total, regardless of changes in the level of activity. Unlike variable costs, fixed costs are not affected by changes in activity. Consequently, as the activity level rises and falls, total fixed costs remain constant unless influenced by some outside force, such as a price change. Rent is a good example of a fixed cost. Suppose the **Mayo Clinic** rents a machine for \$8,000 per month that tests blood samples for the presence of leukemia cells. The \$8,000 monthly rental cost will be incurred regardless of the number of tests that may be performed during the month. The concept of a fixed cost is shown graphically on the right-hand side of Exhibit 1–10.

Very few costs are completely fixed. Most will change if activity changes enough. For example, suppose that the capacity of the leukemia diagnostic machine at the Mayo Clinic is 2,000 tests per month. If the clinic wishes to perform more than 2,000 tests in a month, it would be necessary to rent an additional machine, which would cause a jump in the fixed costs. When we say a cost is fixed, we mean it is fixed within some *relevant range*. The **relevant range** is the range of activity within which the assumptions about variable and fixed costs are valid. For example, the assumption that the rent for diagnostic machines is \$8,000 per month is valid within the relevant range of 0 to 2,000 tests per month.

Fixed costs can create confusion if they are expressed on a per unit basis. This is because the average fixed cost per unit increases and decreases *inversely* with changes in activity. In the Mayo Clinic, for example, the average cost per test will fall as the number of tests performed increases because the \$8,000 rental cost will be spread over more tests. Conversely, as the number of tests performed in the clinic declines, the average cost per test will rise as the \$8,000 rental cost is spread over fewer tests. This concept is illustrated in the table below:

Monthly Rental Cost	Number of Tests Performed	Average Cost per Test
\$8,000	10	\$800
\$8,000	500	\$16
\$8,000	2,000	\$4

IN BUSINESS

Food Costs at a Luxury Hotel



The **Sporthotel Theresa** (<http://www.theresa.at/>), owned and operated by the Egger family, is a four star hotel located in Zell im Zillertal, Austria. The hotel features access to hiking, skiing, biking, and other activities in the Ziller alps as well as its own fitness facility and spa.

Three full meals a day are included in the hotel room charge. Breakfast and lunch are served buffet-style while dinner is a more formal affair with as many as six courses. A sample dinner menu appears below:

Tyrolean cottage cheese with homemade bread

Salad bar

Broccoli-terrine with saddle of venison and smoked goose-breast

or

Chicken-liver parfait with gorgonzola-cheese ravioli and port-wine sauce

Clear vegetable soup with fine vegetable strips

or

Whey-yoghurt juice

Roulade of pork with zucchini, ham and cheese on pesto ribbon noodles and saffron sauce

or

Roasted filet of Irish salmon and prawn with spring vegetables and sesame mash

or

Fresh white asparagus with scrambled egg, fresh herbs, and parmesan

or

Steak of Tyrolean organic beef

Strawberry terrine with homemade chocolate ice cream

or

Iced Viennese coffee

The chef, Stefan Egger, believes that food costs are roughly proportional to the number of guests staying at the hotel; that is, they are a variable cost. He must order food from suppliers two or three days in advance, but he adjusts his purchases to the number of guests who are currently staying at the hotel and their consumption patterns. In addition, guests make their selections from the dinner menu early in the day, which helps Stefan plan which foodstuffs will be required for dinner. Consequently, he is able to prepare just enough food so that all guests are satisfied and yet waste is held to a minimum.

Source: Conversation with Stefan Egger, chef at the Sporhotel Theresa.

Note that if the Mayo Clinic performs only 10 tests each month, the rental cost of the equipment will average \$800 per test. But if 2,000 tests are performed each month, the average cost will drop to only \$4 per test. More will be said later about the misunderstandings created by this variation in average unit costs.

Examples of fixed costs include straight-line depreciation, insurance, property taxes, rent, supervisory salaries, administrative salaries, and advertising.

A summary of both variable and fixed cost behavior is presented in Exhibit 1-11.

Cost	Behavior of the Cost (within the relevant range)	
	In Total	Per Unit
Variable cost	Total variable cost increases and decreases in proportion to changes in the activity level.	Variable cost per unit remains constant.
Fixed cost	Total fixed cost is not affected by changes in the activity level within the relevant range.	Fixed cost per unit decreases as the activity level rises and increases as the activity level falls.

EXHIBIT 1-11
Summary of Variable and Fixed Cost Behavior

The Power of Shrinking Average Fixed Cost per Unit

IN BUSINESS

Intel built five new computer chip manufacturing facilities that put its competitors on the defensive. Each plant can produce chips using a 12-inch wafer that is imprinted with 90-nanometer circuit lines that are 0.1% of the width of a human hair. These plants can produce 1.25 million chips a day, or about 375 million chips a year. Better yet, these new plants slash Intel's production costs in half because each plant's volume of output is 2.5 times greater than any of Intel's seven older plants. Building a computer chip manufacturing facility is a very expensive undertaking due to the required investment in fixed equipment costs. So why are Intel's competitors on the defensive? Because they are struggling to match Intel's exceptionally low average fixed cost per unit of output. Or, in an economist's terms, they are struggling to match Intel's economies of scale.

Source: Cliff Edwards, "Intel," *BusinessWeek*, March 8, 2004, pp. 56–64.

COST CLASSIFICATIONS FOR ASSIGNING COSTS TO COST OBJECTS

Costs are assigned to cost objects for a variety of purposes including pricing, preparing profitability studies, and controlling spending. A **cost object** is anything for which cost data are desired—including products, customers, jobs, and organizational subunits. For purposes of assigning costs to cost objects, costs are classified as either *direct* or *indirect*.

LEARNING OBJECTIVE 7

Understand the differences between direct and indirect costs.

Direct Cost

A **direct cost** is a cost that can be easily and conveniently traced to a specified cost object. The concept of direct cost extends beyond just direct materials and direct labor. For example, if **Reebok** is assigning costs to its various regional and national sales offices, then the salary of the sales manager in its Tokyo office would be a direct cost of that office.



Indirect Cost

An **indirect cost** is a cost that cannot be easily and conveniently traced to a specified cost object. For example, a **Campbell Soup** factory may produce dozens of varieties of canned soups. The factory manager's salary would be an indirect cost of a particular variety such as chicken noodle soup. The reason is that the factory manager's salary is

incurred as a consequence of running the entire factory—it is not incurred to produce any one soup variety. *To be traced to a cost object such as a particular product, the cost must be caused by the cost object.* The factory manager's salary is called a *common cost* of producing the various products of the factory. A **common cost** is a cost that is incurred to support a number of cost objects but cannot be traced to them individually. A common cost is a type of indirect cost.

A particular cost may be direct or indirect, depending on the cost object. While the Campbell Soup factory manager's salary is an *indirect* cost of manufacturing chicken noodle soup, it is a *direct* cost of the manufacturing division. In the first case, the cost object is chicken noodle soup. In the second case, the cost object is the entire manufacturing division.

COST CLASSIFICATIONS FOR DECISION MAKING

LEARNING OBJECTIVE 8

Understand cost classifications used in making decisions: differential costs, opportunity costs, and sunk costs.



Costs are an important feature of many business decisions. In making decisions, it is essential to have a firm grasp of the concepts *differential cost*, *opportunity cost*, and *sunk cost*.

Differential Cost and Revenue

Decisions involve choosing between alternatives. In business decisions, each alternative will have costs and benefits that must be compared to the costs and benefits of the other available alternatives. A difference in costs between any two alternatives is known as a **differential cost**. A difference in revenues between any two alternatives is known as **differential revenue**.

A differential cost is also known as an **incremental cost**, although technically an incremental cost should refer only to an increase in cost from one alternative to another; decreases in cost should be referred to as *decremental costs*. Differential cost is a broader term, encompassing both cost increases (incremental costs) and cost decreases (decremental costs) between alternatives.

The accountant's differential cost concept can be compared to the economist's marginal cost concept. In speaking of changes in cost and revenue, the economist uses the terms *marginal cost* and *marginal revenue*. The revenue that can be obtained from selling one more unit of product is called marginal revenue, and the cost involved in producing one more unit of product is called marginal cost. The economist's marginal concept is basically the same as the accountant's differential concept applied to a single unit of output.

IN BUSINESS

The Cost of a Healthier Alternative

McDonald's is under pressure from critics to address the health implications of its menu. In response, McDonald's switched from partially hydrogenated vegetable oil to fry foods to a new soybean oil that cuts trans-fat levels by 48% even though the soybean oil is much more expensive than the partially hydrogenated vegetable oil and it lasts only half as long. What were the cost implications of this change? A typical McDonald's restaurant uses 500 pounds of the relatively unhealthy oil per week at a cost of about \$186. In contrast, the same restaurant would need to use 1,000 pounds of the new soybean oil per week at a cost of about \$571. This is a differential cost of \$385 per restaurant per week. This may seem like a small amount of money until the calculation is expanded to include 13,000 McDonald's restaurants operating 52 weeks a year. Now, the total tab for a more healthy frying oil rises to about \$260 million per year.

Source: Matthew Boyle, "Can You Really Make Fast Food Healthy?" *Fortune*, August 9, 2004, pp. 134–139.



Differential costs can be either fixed or variable. To illustrate, assume that Nature Way Cosmetics, Inc., is thinking about changing its marketing method from distribution through retailers to distribution by a network of neighborhood sales representatives. Present costs and revenues are compared to projected costs and revenues in the following table:

	Retailer Distribution (present)	Sales Representatives (proposed)	Differential Costs and Revenues
Revenues (Variable).....	\$700,000	\$800,000	\$100,000
Cost of goods sold (Variable)	350,000	400,000	50,000
Advertising (Fixed).....	80,000	45,000	(35,000)
Commissions (Variable).....	0	40,000	40,000
Warehouse depreciation (Fixed).....	50,000	80,000	30,000
Other expenses (Fixed)	60,000	60,000	0
Total expenses	540,000	625,000	85,000
Net operating income.....	\$160,000	\$175,000	\$ 15,000

According to the above analysis, the differential revenue is \$100,000 and the differential costs total \$85,000, leaving a positive differential net operating income of \$15,000 under the proposed marketing plan.

The decision of whether Nature Way Cosmetics should stay with the present retail distribution or switch to sales representatives could be made on the basis of the net operating incomes of the two alternatives. As we see in the above analysis, the net operating income under the present distribution method is \$160,000, whereas the net operating income with sales representatives is estimated to be \$175,000. Therefore, using sales representatives is preferred because it would result in \$15,000 higher net operating income. Note that we would have arrived at exactly the same conclusion by simply focusing on the differential revenues, differential costs, and differential net operating income, which also show a \$15,000 advantage for sales representatives.

In general, only the differences between alternatives are relevant in decisions. Those items that are the same under all alternatives and that are not affected by the decision can be ignored. For example, in the Nature Way Cosmetics example above, the “Other expenses” category, which is \$60,000 under both alternatives, can be ignored because it has no effect on the decision. If it were removed from the calculations, the sales representatives would still be preferred by \$15,000. This is an extremely important principle in management accounting that we will revisit in later chapters.

Opportunity Cost

Opportunity cost is the potential benefit that is given up when one alternative is selected over another. To illustrate this important concept, consider the following examples:



Example 1 Vicki has a part-time job that pays \$200 per week while attending college. She would like to spend a week at the beach during spring break, and her employer has agreed to give her the time off, but without pay. The \$200 in lost wages would be an opportunity cost of taking the week off to be at the beach.

Example 2 Suppose that **Neiman Marcus** is considering investing a large sum of money in land that may be a site for a future store. Rather than invest the funds in land, the company could invest the funds in high-grade securities. The opportunity cost of buying the land is the investment income that could have been realized by purchasing the securities instead.

Example 3 Steve is employed by a company that pays him a salary of \$38,000 per year. He is thinking about leaving the company and returning to school. Because returning to school would require that he give up his \$38,000 salary, the forgone salary would be an opportunity cost of seeking further education.

Opportunity costs are not usually found in accounting records, but they are costs that must be explicitly considered in every decision a manager makes. Virtually every alternative involves an opportunity cost.

YOU DECIDE

Your Decision to Attend Class

When you make the decision to attend class on a particular day, what are the opportunity costs that are inherent in that decision?

Sunk Cost

A **sunk cost** is a cost *that has already been incurred* and that cannot be changed by any decision made now or in the future. Because sunk costs cannot be changed by any decision, they are not differential costs. And because only differential costs are relevant in a decision, sunk costs can and should be ignored.

To illustrate a sunk cost, assume that a company paid \$50,000 several years ago for a special-purpose machine. The machine was used to make a product that is now obsolete and is no longer being sold. Even though in hindsight purchasing the machine may have been unwise, the \$50,000 cost has already been incurred and cannot be undone. And it would be folly to continue making the obsolete product in a misguided attempt to “recover” the original cost of the machine. In short, the \$50,000 originally paid for the machine is a sunk cost that should be ignored in current decisions.

CONCEPT CHECK

3. Which of the following cost behavior assumptions is true? (You may select more than one answer.)
 - a. Variable costs are constant if expressed on a per unit basis.
 - b. Total variable costs increase as the level of activity increases.
 - c. The average fixed cost per unit increases as the level of activity increases.
 - d. Total fixed costs decrease as the level of activity decreases.
4. Which of the following statements is true? (You may select more than one answer.)
 - a. A common cost is one type of direct cost.
 - b. A sunk cost is usually a differential cost.
 - c. Opportunity costs are not usually recorded in the accounts of an organization.
 - d. A particular cost may be direct or indirect depending on the cost object.

SUMMARY

LO1 Identify the major differences and similarities between financial and managerial accounting.

Managers use managerial accounting reports in their planning and controlling activities. Unlike financial accounting reports, these managerial accounting reports need not conform to Generally Accepted Accounting Principles and are not mandatory. In particular, managerial accounting

places more emphasis on the future and relevance of the data, less emphasis on precision, and focuses more on the segments of the organization than does financial accounting.

LO2 Identify and give examples of each of the three basic manufacturing cost categories.

Manufacturing costs consist of two categories of costs that can be conveniently and directly traced to units of product—direct materials and direct labor—and one category that cannot be conveniently traced to units of product—manufacturing overhead.

LO3 Distinguish between product costs and period costs and give examples of each.

For purposes of valuing inventories and determining expenses for the balance sheet and income statement, costs are classified as either product costs or period costs. Product costs are assigned to inventories and are considered assets until the products are sold. A product cost becomes an expense—cost of goods sold—only when the product is sold. In contrast, period costs are taken directly to the income statement as expenses in the period in which they are incurred.

In a merchandising company, product cost is whatever the company paid for its merchandise. For external financial reports in a manufacturing company, product costs consist of all manufacturing costs. In both kinds of companies, selling and administrative costs are considered to be period costs and are expensed as incurred.

LO4 Prepare an income statement including calculation of the cost of goods sold.

See Exhibit 1–4 for examples of income statements for both a merchandising and a manufacturing company. Net operating income is computed by deducting the cost of goods sold and selling and administrative expenses from sales. In a merchandising company, cost of goods sold is calculated by adding purchases to the beginning merchandise inventory and then deducting the ending merchandise inventory. In a manufacturing company, cost of goods sold is computed by adding the cost of goods manufactured to the beginning finished goods inventory and then deducting the ending finished goods inventory.

LO5 Prepare a schedule of cost of goods manufactured.

The cost of goods manufactured is the sum of direct materials, direct labor, and manufacturing overhead costs associated with the goods that were finished during the period. See Exhibit 1–6 for an example of a schedule of cost of goods manufactured.

LO6 Understand the differences between variable costs and fixed costs.

For purposes of predicting cost behavior—how costs will react to changes in activity—costs are commonly categorized as variable or fixed. Total variable costs are strictly proportional to activity. Thus, the variable cost per unit is constant. Total fixed costs remain the same when the level of activity fluctuates within the relevant range. Thus, the average fixed cost per unit decreases as the number of units increases.

LO7 Understand the differences between direct and indirect costs.

A direct cost such as direct materials is a cost that can be easily and conveniently traced to a cost object. An indirect cost is a cost that cannot be easily and conveniently traced to a cost object. For example, the salary of the administrator of a hospital is an indirect cost of serving a particular patient.

LO8 Understand cost classifications used in making decisions: differential costs, opportunity costs, and sunk costs.

The concepts of differential cost and revenue, opportunity cost, and sunk cost are vitally important for purposes of making decisions. Differential costs and revenues refer to the costs and revenues that differ between alternatives. Opportunity cost is the benefit that is forgone when one alternative is selected over another. Sunk cost is a cost that occurred in the past and cannot be altered. Differential costs and opportunity costs are relevant in decisions and should be carefully considered. Sunk costs are always irrelevant in decisions and should be ignored.

The various cost classifications discussed in this chapter are different ways of looking at costs. A particular cost, such as the cost of cheese in a taco served at **Taco Bell**, can be a manufacturing cost, a product cost, a variable cost, a direct cost, and a differential cost—all at the

same time. Taco Bell essentially manufactures fast food. Therefore the cost of the cheese in a taco would be considered a manufacturing cost as well as a product cost. In addition, the cost of cheese would be considered variable with respect to the number of tacos served and would be a direct cost of serving tacos. Finally, the cost of the cheese in a taco would be considered a differential cost of the taco.

GUIDANCE ANSWERS TO YOU DECIDE

Your Decision to Attend Class (p. 52)

Every alternative involves an opportunity cost. Think about what you could be doing instead of attending class.

- You could have been working at a part-time job; you could quantify that cost by multiplying your pay rate by the time you spend preparing for and attending class.
- You could have spent the time studying for another class; the opportunity cost could be measured by the improvement in the grade that would result from spending more time on the other class.
- You could have slept in or taken a nap; depending on your level of sleep deprivation, this opportunity cost might be priceless.



GUIDANCE ANSWERS TO CONCEPT CHECKS

1. **Choices b and d.** Conversion costs do not include direct materials. Prime costs include direct materials and direct labor, which are not part of manufacturing overhead.
2. **Choice c.** The cost of goods manufactured equals the cost of goods sold of \$100,000 plus the increase in the inventory account of \$30,000.
3. **Choices a and b.** The average fixed cost per unit decreases, rather than increases, as the level of activity increases. Total fixed costs do not change as the level of activity decreases (within the relevant range).
4. **Choices c and d.** A common cost is one type of indirect cost, rather than direct cost. A sunk cost is not a differential cost.

REVIEW PROBLEM 1: COST TERMS

Many new cost terms have been introduced in this chapter. It will take you some time to learn what each term means and how to properly classify costs in an organization. Consider the following example: Chippen Corporation manufactures furniture, including tables. Selected costs are given below:

1. The tables are made of wood that costs \$100 per table.
2. The tables are assembled by workers, at a wage cost of \$40 per table.
3. Workers making the tables are supervised by a factory supervisor who is paid \$38,000 per year.
4. Electrical costs are \$2 per machine-hour. Four machine-hours are required to produce a table.
5. The depreciation on the machines used to make the tables totals \$10,000 per year. The machines have no resale value and do not wear out through use.
6. The salary of the president of the company is \$100,000 per year.
7. The company spends \$250,000 per year to advertise its products.
8. Salespersons are paid a commission of \$30 for each table sold.
9. Instead of producing the tables, the company could rent its factory space for \$50,000 per year.

Required:

Classify these costs according to the various cost terms used in the chapter. *Carefully study the classification of each cost.* If you don't understand why a particular cost is classified the way it is, reread the section of the chapter discussing the particular cost term. The terms *variable cost* and *fixed cost* refer to how costs behave with respect to the number of tables produced in a year.

Solution to Review Problem 1

	Variable Cost	Fixed Cost	Period (Selling and Administrative) Cost	Product Cost			Sunk Cost	Opportunity Cost
				Direct Materials	Direct Labor	Manufacturing Overhead		
1. Wood used in a table (\$100 per table)	X			X				
2. Labor cost to assemble a table (\$40 per table)	X				X			
3. Salary of the factory supervisor (\$38,000 per year)		X				X		
4. Cost of electricity to produce tables (\$2 per machine-hour)	X					X		
5. Depreciation of machines used to produce tables (\$10,000 per year)		X				X	X*	
6. Salary of the company president (\$100,000 per year)		X	X					
7. Advertising expense (\$250,000 per year)		X	X					
8. Commissions paid to salespersons (\$30 per table sold)	X		X					
9. Rental income forgone on factory space								X†

*This is a sunk cost because the outlay for the equipment was made in a previous period.
 †This is an opportunity cost because it represents the potential benefit that is lost or sacrificed as a result of using the factory space to produce tables. Opportunity cost is a special category of cost that is not ordinarily recorded in an organization's accounting records. To avoid possible confusion with other costs, we will not attempt to classify this cost in any other way except as an opportunity cost.

REVIEW PROBLEM 2: SCHEDULE OF COST OF GOODS MANUFACTURED AND INCOME STATEMENT

The following information has been taken from the accounting records of Klear-Seal Corporation for last year:

Selling expenses	\$140,000
Raw materials inventory, January 1	\$90,000
Raw materials inventory, December 31	\$60,000
Direct labor cost	\$150,000
Purchases of raw materials	\$750,000
Sales	\$2,500,000
Administrative expenses	\$270,000
Manufacturing overhead	\$640,000
Work in process inventory, January 1	\$180,000
Work in process inventory, December 31	\$100,000
Finished goods inventory, January 1	\$260,000
Finished goods inventory, December 31	\$210,000

Management wants these data organized in a better format so that financial statements can be prepared for the year.

Required:

1. Prepare a schedule of cost of goods manufactured as in Exhibit 1–6. Assume raw materials consists entirely of direct materials.
2. Compute the cost of goods sold as in Exhibit 1–4.
3. Prepare an income statement.

Solution to Review Problem 2

1.

Klear-Seal Corporation		
Schedule of Cost of Goods Manufactured		
For the Year Ended December 31		
Direct materials:		
Raw materials inventory, January 1	\$ 90,000	
Add: Purchases of raw materials.....	<u>750,000</u>	
Raw materials available for use	840,000	
Deduct: Raw materials inventory, December 31	<u>60,000</u>	
Raw materials used in production		\$ 780,000
Direct labor.....		150,000
Manufacturing overhead		<u>640,000</u>
Total manufacturing cost.....		1,570,000
Add: Work in process inventory, January 1		<u>180,000</u>
		1,750,000
Deduct: Work in process inventory, December 31		<u>100,000</u>
Cost of goods manufactured.....		<u>\$1,650,000</u>

2. The cost of goods sold would be computed as follows:

Finished goods inventory, January 1	\$ 260,000
Add: Cost of goods manufactured	<u>1,650,000</u>
Goods available for sale	1,910,000
Deduct: Finished goods inventory, December 31	<u>210,000</u>
Cost of goods sold*	<u>\$1,700,000</u>

*Further adjustments will be made to cost of goods sold in the next chapter.

3.

Klear-Seal Corporation		
Income Statement		
For the Year Ended December 31		
Sales.....		\$2,500,000
Cost of goods sold (above).....		<u>1,700,000</u>
Gross margin		800,000
Selling and administrative expenses:		
Selling expenses	\$140,000	
Administrative expenses	<u>270,000</u>	410,000
Net operating income		<u>\$ 390,000</u>

GLOSSARY

- Administrative costs** All executive, organizational, and clerical costs associated with the general management of an organization rather than with manufacturing or selling. (p. 35)
- Budget** A detailed plan for the future, usually expressed in formal quantitative terms. (p. 29)
- Common cost** A cost that is incurred to support a number of cost objects but that cannot be traced to them individually. For example, the wage cost of the pilot of a 747 airliner is a common cost of all of the passengers on the aircraft. Without the pilot, there would be no flight and no passengers. But no part of the pilot's wage is caused by any one passenger taking the flight. (p. 50)
- Control** The process of instituting procedures and then obtaining feedback to ensure that all parts of the organization are functioning effectively and moving toward overall company goals. (p. 29)
- Controller** The member of the top management team who is responsible for providing relevant and timely data to managers and for preparing financial statements for external users. The controller reports to the CFO. (p. 29)
- Controlling** Actions taken to help ensure that the plan is being followed and is appropriately modified as circumstances change. (p. 28)
- Conversion cost** Direct labor cost plus manufacturing overhead cost. (p. 36)
- Cost behavior** The way in which a cost reacts to changes in the level of activity. (p. 45)
- Cost object** Anything for which cost data are desired. Examples of cost objects are products, customers, jobs, and parts of the organization such as departments or divisions. (p. 49)
- Cost of goods manufactured** The manufacturing costs associated with the goods that were finished during the period. (p. 41)
- Differential cost** A difference in cost between two alternatives. Also see *Incremental cost*. (p. 50)
- Differential revenue** The difference in revenue between two alternatives. (p. 50)
- Direct cost** A cost that can be easily and conveniently traced to a specified cost object. (p. 49)
- Directing and motivating** Mobilizing people to carry out plans and run routine operations. (p. 28)
- Direct labor** Factory labor costs that can be easily traced to individual units of product. Also called *touch labor*. (p. 34)
- Direct materials** Materials that become an integral part of a finished product and whose costs can be conveniently traced to it. (p. 33)
- Feedback** Accounting and other reports that help managers monitor performance and focus on problems and/or opportunities that might otherwise go unnoticed. (p. 29)
- Financial accounting** The phase of accounting concerned with providing information to stockholders, creditors, and others outside the organization. (p. 30)
- Finished goods** Units of product that have been completed but not yet sold to customers. (p. 38)
- Fixed cost** A cost that remains constant, in total, regardless of changes in the level of activity within the relevant range. If a fixed cost is expressed on a per unit basis, it varies inversely with the level of activity. (p. 47)
- Incremental cost** An increase in cost between two alternatives. Also see *Differential cost*. (p. 50)
- Indirect cost** A cost that cannot be easily and conveniently traced to a specified cost object. (p. 49)
- Indirect labor** The labor costs of janitors, supervisors, materials handlers, and other factory workers that cannot be conveniently traced to particular products. (p. 34)
- Indirect materials** Small items of material such as glue and nails that may be an integral part of a finished product, but whose costs cannot be easily or conveniently traced to it. (p. 34)
- Inventoriable costs** Synonym for *product costs*. (p. 35)
- Managerial accounting** The phase of accounting concerned with providing information to managers for use within the organization. (p. 30)
- Manufacturing overhead** All manufacturing costs except direct materials and direct labor. (p. 34)
- Opportunity cost** The potential benefit that is given up when one alternative is selected over another. (p. 51)
- Performance report** A detailed report comparing budgeted data to actual data. (p. 29)
- Period costs** Costs that are taken directly to the income statement as expenses in the period in which they are incurred or accrued. (p. 36)
- Planning** Selecting a course of action and specifying how the action will be implemented. (p. 28)
- Planning and control cycle** The flow of management activities through planning, directing and motivating, and controlling, and then back to planning again. (p. 30)
- Prime cost** Direct materials cost plus direct labor cost. (p. 36)
- Product costs** All costs that are involved in acquiring or making a product. In the case of manufactured goods, these costs consist of direct materials, direct labor, and manufacturing overhead. Also see *Inventoriable costs*. (p. 35)

Raw materials Any materials that go into the final product. (pp. 33, 38)

Relevant range The range of activity within which assumptions about variable and fixed cost behavior are valid. (p. 47)

Schedule of cost of goods manufactured A schedule showing the direct materials, direct labor, and manufacturing overhead costs incurred during a period and the portion of those costs that are assigned to Work in Process and Finished Goods. (p. 41)

Segment Any part of an organization that can be evaluated independently of other parts and about which the manager seeks financial data. Examples include a product line, a sales territory, a division, or a department. (p. 32)

Selling costs All costs that are incurred to secure customer orders and get the finished product or service into the hands of the customer. (p. 35)

Sunk cost A cost that has already been incurred and that cannot be changed by any decision made now or in the future. (p. 52)

Variable cost A cost that varies, in total, in direct proportion to changes in the level of activity. A variable cost is constant per unit. (p. 45)

Work in process Units of product that are only partially complete. (p. 38)

QUESTIONS

- 1-1 Describe the three major activities of a manager.
- 1-2 What are the four steps in the planning and control cycle?
- 1-3 What are the major differences between financial and managerial accounting?
- 1-4 What are the three major elements of product costs in a manufacturing company?
- 1-5 Define the following: (a) direct materials, (b) indirect materials, (c) direct labor, (d) indirect labor, and (e) manufacturing overhead.
- 1-6 Explain the difference between a product cost and a period cost.
- 1-7 Describe how the income statement of a manufacturing company differs from the income statement of a merchandising company.
- 1-8 Describe the schedule of cost of goods manufactured. How does it tie into the income statement?
- 1-9 Describe how the inventory accounts of a manufacturing company differ from the inventory account of a merchandising company.
- 1-10 Why are product costs sometimes called inventoriable costs? Describe the flow of such costs in a manufacturing company from the point of incurrence until they finally become expenses on the income statement.
- 1-11 Is it possible for costs such as salaries or depreciation to end up as assets on the balance sheet? Explain.
- 1-12 “The variable cost per unit varies with output, whereas the fixed cost per unit is constant.” Do you agree? Explain.
- 1-13 Define the following terms: differential cost, opportunity cost, and sunk cost.
- 1-14 Only variable costs can be differential costs. Do you agree? Explain.



Multiple-choice questions are provided on the text website at www.mhhe.com/brewer5e.

BRIEF EXERCISES

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BRIEF EXERCISE 1-1 The Work of Management and Managerial and Financial Accounting [LO1]

A number of terms that relate to organizations, the work of management, and the role of managerial accounting are listed below:

Budgets	Controller
Directing and motivating	Feedback
Financial accounting	Managerial accounting
Performance report	Planning
Precision	Timeliness

Required:

Choose the term or terms above that most appropriately complete the following statements. A term may be used more than once or not at all.

1. When _____, managers mobilize people to carry out plans and run routine operations.
2. The plans of management are expressed formally in _____.
3. _____ consists of identifying alternatives, selecting from among the alternatives the one that is best for the organization, and specifying what actions will be taken to implement the chosen alternative.
4. Managerial accounting places less emphasis on _____ and more emphasis on _____ than financial accounting.
5. _____ is concerned with providing information for the use of those who are inside the organization, whereas _____ is concerned with providing information for the use of those who are outside the organization.
6. _____ emphasizes detailed segment reports about departments, customers, products, and customers.
7. _____ must follow GAAP, whereas _____ need not follow GAAP.
8. The accounting and other reports that help managers monitor performance and focus on problems and/or opportunities are a form of _____.
9. The manager in charge of the accounting department is usually known as the _____.
10. A detailed report to management comparing budgeted data with actual data for a specific time period is a _____.

BRIEF EXERCISE 1-2 Classifying Manufacturing Costs [LO2]

The PC Works assembles custom computers from components supplied by various manufacturers. The company is very small and its assembly shop and retail sales store are housed in a single facility in a Redmond, Washington, industrial park. Listed below are some of the costs that are incurred at the company.

Required:

For each cost, indicate whether it would most likely be classified as direct labor, direct materials, manufacturing overhead, selling, or an administrative cost.

1. The cost of a hard drive installed in a computer.
2. The cost of advertising in the *Puget Sound Computer User* newspaper.
3. The wages of employees who assemble computers from components.
4. Sales commissions paid to the company's salespeople.
5. The wages of the assembly shop's supervisor.
6. The wages of the company's accountant.
7. Depreciation on equipment used to test assembled computers before release to customers.
8. Rent on the facility in the industrial park.

BRIEF EXERCISE 1-3 Classification of Costs as Period or Product Cost [LO3]

Suppose that you have been given a summer job as an intern at Issac Aircams, a company that manufactures sophisticated spy cameras for remote-controlled military reconnaissance aircraft. The company, which is privately owned, has approached a bank for a loan to help it finance its growth. The bank requires financial statements before approving such a loan. You have been asked to help prepare the financial statements and were given the following list of costs:

1. Depreciation on salespersons' cars.
2. Rent on equipment used in the factory.
3. Lubricants used for machine maintenance.
4. Salaries of personnel who work in the finished goods warehouse.
5. Soap and paper towels used by factory workers at the end of a shift.
6. Factory supervisors' salaries.
7. Heat, water, and power consumed in the factory.
8. Materials used for boxing products for shipment overseas. (Units are not normally boxed.)
9. Advertising costs.
10. Workers' compensation insurance for factory employees.
11. Depreciation on chairs and tables in the factory lunchroom.
12. The wages of the receptionist in the administrative offices.
13. Cost of leasing the corporate jet used by the company's executives.
14. The cost of renting rooms at a Florida resort for the annual sales conference.
15. The cost of packaging the company's product.

Required:

Classify the above costs as either product costs or period costs for the purpose of preparing the financial statements for the bank.


BRIEF EXERCISE 1-4 Constructing an Income Statement [LO4]

Last month CyberGames, a computer game retailer, had total sales of \$1,450,000, selling expenses of \$210,000, and administrative expenses of \$180,000. The company had beginning merchandise inventory of \$240,000, purchased additional merchandise inventory for \$950,000, and had ending merchandise inventory of \$170,000.

Required:

Prepare an income statement for the company for the month.

BRIEF EXERCISE 1-5 Prepare a Schedule of Cost of Goods Manufactured [LO5]

Lompac Products manufactures a variety of products in its factory. Data for the most recent month's operations appear below:

Beginning raw materials inventory	\$60,000
Purchases of raw materials.....	\$690,000
Ending raw materials inventory.....	\$45,000
Direct labor.....	\$135,000
Manufacturing overhead.....	\$370,000
Beginning work in process inventory	\$120,000
Ending work in process inventory	\$130,000

Required:

Prepare a schedule of cost of goods manufactured for the company for the month.


BRIEF EXERCISE 1-6 Classification of Costs as Fixed or Variable [LO6]

Below are costs and measures of activity in a variety of organizations.

Required:

Classify each cost as variable or fixed with respect to the indicated measure of activity by placing an *X* in the appropriate column.

Cost	Measure of Activity	Cost Behavior	
		Variable	Fixed
1. The cost of X-ray film used in the radiology lab at Virginia Mason Hospital in Seattle	Number of X-rays taken		
2. The cost of advertising a rock concert in New York City	Number of rock concert tickets sold		
3. The cost of renting retail space for a McDonald's restaurant in Hong Kong	Total sales at the restaurant		
4. The electrical cost of running a roller coaster at Magic Mountain	Number of times the roller coaster is run		
5. Property taxes paid by your local cinema theater	Number of tickets sold		
6. The cost of sales commissions paid to salespersons at a Nordstrom store	Total sales at the store		
7. Property insurance on a Coca-Cola bottling plant	Number of cases of bottles produced		
8. The costs of synthetic materials used to make a particular model of running shoe	Number of shoes of that model produced		

(continued)

Cost	Measure of Activity	Cost Behavior	
		Variable	Fixed
9. The costs of shipping Panasonic televisions to retail stores	The number of televisions sold		
10. The cost of leasing an ultrascan diagnostic machine at the American Hospital in Paris	The number of patients who are scanned with the machine		

BRIEF EXERCISE 1-7 Identifying Direct and Indirect Costs [LO7]

Northwest Hospital is a full-service hospital that provides everything from major surgery and emergency room care to outpatient clinics.



Required:

For each cost incurred at Northwest Hospital, indicate whether it would most likely be a direct cost or an indirect cost of the specified cost object by placing an X in the appropriate column.

Cost	Cost Object	Direct Cost	Indirect Cost
Ex. Catered food served to patients	A particular patient	X	
1. The wages of pediatric nurses	The pediatric department		
2. Prescription drugs	A particular patient		
3. Heating the hospital	The pediatric department		
4. The salary of the head of pediatrics	The pediatric department		
5. The salary of the head of pediatrics	A particular pediatric patient		
6. Hospital chaplain's salary	A particular patient		
7. Lab tests by outside contractor	A particular patient		
8. Lab tests by outside contractor	A particular department		

BRIEF EXERCISE 1-8 Differential, Opportunity, and Sunk Costs [LO8]

Northwest Hospital is a full-service hospital that provides everything from major surgery and emergency room care to outpatient clinics. The hospital's Radiology Department is considering replacing an old inefficient X-ray machine with a state-of-the-art digital X-ray machine. The new machine would provide higher quality X-rays in less time and at a lower cost per X-ray. It would also require less power and would use a color laser printer to produce easily readable X-ray images. Instead of investing the funds in the new X-ray machine, the Laboratory Department is lobbying the hospital's management to buy a new DNA analyzer.



Required:

For each of the items below, indicate by placing an X in the appropriate column whether it should be considered a differential cost, an opportunity cost, or a sunk cost in the decision to replace the old X-ray machine with a new machine. If none of the categories apply for a particular item, leave all columns blank.

Item	Differential Cost	Opportunity Cost	Sunk Cost
Ex. Cost of X-ray film used in the old machine	X		
1. Cost of the old X-ray machine.....			
2. The salary of the head of the Radiology Department ...			
3. The salary of the head of the Pediatrics Department			
4. Cost of the new color laser printer			
5. Rent on the space occupied by Radiology.....			
6. The cost of maintaining the old machine			
7. Benefits from a new DNA analyzer			
8. Cost of electricity to run the X-ray machines			

EXERCISES

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EXERCISE 1-9 Definitions of Cost Terms [LO2, LO3, LO6, LO8]

Following are a number of cost terms introduced in the chapter:

Variable cost	Product cost
Fixed cost	Sunk cost
Prime cost	Conversion cost
Opportunity cost	Period cost

Required:

Choose the term or terms above that most appropriately describe the cost identified in each of the following situations. A cost term can be used more than once.

- Lake Company produces a popular tote bag. The cloth used to manufacture the tote bag is direct materials and for financial accounting purposes is classified as a(n) _____. In terms of cost behavior, the cloth could also be described as a(n) _____.
- The direct labor cost required to produce the tote bags, combined with manufacturing overhead cost, is called _____.
- The company could have taken the funds that it has invested in production equipment and invested them in interest-bearing securities instead. The interest forgone on the securities is a(n) _____.
- Taken together, the direct materials cost and the direct labor cost required to produce tote bags is called _____.
- Formerly, the company produced a smaller tote bag that was not very popular. Three hundred of these smaller bags are stored in one of the company's warehouses. The amount invested in these bags is called a(n) _____.
- Tote bags are sold through agents who are paid a commission on each bag sold. For financial accounting purposes, these commissions are classified as a(n) _____. In terms of cost behavior, commissions are classified as a(n) _____.
- For financial accounting purposes, depreciation on the equipment used to produce tote bags is a(n) _____. However, for financial accounting purposes, depreciation on any equipment used by the company in selling and administrative activities is classified as a(n) _____. In terms of cost behavior, depreciation is usually a(n) _____.
- A(n) _____ is also known as an inventoriable cost, because such costs go into the Work in Process inventory account and then into the Finished Goods inventory account before appearing on the income statement as part of Cost of Goods Sold.
- For financial accounting purposes, the salary of Lake Company's president is classified as a(n) _____, because the salary will appear on the income statement as an expense in the time period in which it is incurred.
- Costs are often classified in several ways. For example, Lake Company pays \$5,000 rent each month on its factory building. The rent is part of manufacturing overhead. In terms of cost behavior, it would be classified as a(n) _____. The rent can also be classified as a(n) _____ and as a(n) _____.

**EXERCISE 1-10 Classification of Costs as Variable or Fixed and as Selling and Administrative or Product [LO3, LO6]**

Below are listed various costs that are found in organizations.

- Hamburger buns in a Wendy's outlet.
- Advertising by a dental office.
- Apples processed and canned by Del Monte.
- Shipping canned apples from a Del Monte plant to customers.
- Insurance on a Bausch & Lomb factory producing contact lenses.
- Insurance on IBM's corporate headquarters.
- Salary of a supervisor overseeing production of printers at Hewlett-Packard.
- Commissions paid to Encyclopedia Britannica salespersons.
- Depreciation of factory lunchroom facilities at a General Electric plant.
- Steering wheels installed in BMWs.

Required:

Classify each cost as being either variable or fixed with respect to the number of units produced and sold. Also classify each cost as either a selling and administrative cost or a product cost. Prepare your answer sheet as shown below. Place an X in the appropriate columns to show the proper classification of each cost.

Cost Item	Cost Behavior		Selling and Administrative Cost	Product Cost
	Variable	Fixed		

EXERCISE 1-11 Preparing a Schedule of Costs of Goods Manufactured and Cost of Goods Sold [LO2, LO4, LO5]

The following cost and inventory data are taken from the accounting records of Mason Company for the year just completed:

Costs incurred:	
Direct labor cost	\$70,000
Purchases of raw materials	\$118,000
Manufacturing overhead	\$80,000
Advertising expense	\$90,000
Sales salaries	\$50,000
Depreciation, office equipment.....	\$3,000

	Beginning of the Year	End of the Year
Inventories:		
Raw materials	\$7,000	\$15,000
Work in process	\$10,000	\$5,000
Finished goods	\$20,000	\$35,000

Required:

1. Prepare a schedule of cost of goods manufactured.
2. Prepare the cost of goods sold section of Mason Company's income statement for the year.

EXERCISE 1-12 Product Cost Flows; Product versus Period Costs [LO3, LO4]

The Devon Motor Company produces motorcycles. During April, the company purchased 8,000 batteries at a cost of \$10 per battery. Devon withdrew 7,600 batteries from the storeroom during the month. Of these, 100 were used to replace batteries in motorcycles used by the company's traveling sales staff. The remaining 7,500 batteries withdrawn from the storeroom were placed in motorcycles being produced by the company. Of the motorcycles in production during April, 90% were completed and transferred from work in process to finished goods. Of the motorcycles completed during the month, 30% were unsold at April 30.

There were no inventories of any type on April 1.

Required:

1. Determine the cost of batteries that would appear in each of the following accounts at April 30:
 - a. Raw Materials.
 - b. Work in Process.
 - c. Finished Goods.
 - d. Cost of Goods Sold.
 - e. Selling Expense.
2. Specify whether each of the above accounts would appear on the balance sheet or on the income statement at April 30.

PROBLEMS



Alternate problem set is available on the text website.

CHECK FIGURE

Boxes for packaging:
variable, direct

PROBLEM 1-13A Cost Classification [LO3, LO6, LO7]

Listed below are costs found in various organizations.

1. Property taxes, factory.
2. Boxes used for packaging detergent produced by the company.
3. Salespersons' commissions.
4. Supervisor's salary, factory.
5. Depreciation, executive autos.
6. Wages of workers assembling computers.
7. Insurance, finished goods warehouses.
8. Lubricants for production equipment.
9. Advertising costs.
10. Microchips used in producing calculators.
11. Shipping costs on merchandise sold.
12. Magazine subscriptions, factory lunchroom.
13. Thread in a garment factory.
14. Billing costs.
15. Executive life insurance.
16. Ink used in textbook production.
17. Fringe benefits, assembly-line workers.
18. Yarn used in sweater production.
19. Wages of receptionist, executive offices.

Required:

Prepare an answer sheet with column headings as shown below. For each cost item, indicate whether it would be variable or fixed with respect to the number of units produced and sold; and then whether it would be a selling cost, an administrative cost, or a manufacturing cost. If it is a manufacturing cost, indicate whether it would typically be treated as a direct cost or an indirect cost with respect to units of product. Three sample answers are provided for illustration.

Cost Item	Variable or Fixed	Selling Cost	Administrative Cost	Manufacturing (Product) Cost	
				Direct	Indirect
Direct labor	V			X	
Executive salaries	F		X		
Factory rent.....	F				X

CHECK FIGURE

Depreciation: fixed,
manufacturing overhead,
sunk

PROBLEM 1-14A Cost Classification [LO2, LO3, LO6, LO8]

Wologong Group Ltd. of New South Wales, Australia, acquired its factory building about 10 years ago. For several years, the company has rented out a small annex attached to the rear of the building. The company has received a rental income of \$30,000 per year on this space. The renter's lease will expire soon, and rather than renewing the lease, the company has decided to use the space itself to manufacture a new product.

Direct materials cost for the new product will total \$80 per unit. To have a place to store finished units of product, the company will rent a small warehouse nearby. The rental cost will be \$500 per month. In addition, the company must rent equipment for use in producing the new product; the rental cost will be \$4,000 per month. Workers will be hired to manufacture the new product, with direct labor cost amounting to \$60 per unit. The space in the annex will continue to be depreciated on a straight-line basis, as in prior years. This depreciation is \$8,000 per year.

Advertising costs for the new product will total \$50,000 per year. A supervisor will be hired to oversee production; her salary will be \$1,500 per month. Electricity for operating machines will be \$1.20 per unit. Costs of shipping the new product to customers will be \$9 per unit.

To provide funds to purchase materials, meet payrolls, and so forth, the company will have to liquidate some temporary investments. These investments are presently yielding a return of about \$3,000 per year.

Required:

Prepare an answer sheet with the following column headings:

Name of the Cost	Product Cost					Period (Selling and Administrative) Cost	Opportunity Cost	Sunk Cost
	Variable Cost	Fixed Cost	Direct Materials	Direct Labor	Manufacturing Overhead			

List the different costs associated with the new product decision down the extreme left column (under Name of the Cost). Then place an X under each heading that helps to describe the type of cost involved. There may be X's under several column headings for a single cost. (For example, a cost may be a fixed cost, a period cost, and a sunk cost; you would place an X under each of these column headings opposite the cost.)

PROBLEM 1-15A Cost Classification [LO6, LO7]

Various costs associated with the operation of factories are given below:

1. Electricity to run production equipment.
2. Rent on a factory building.
3. Cloth used to make drapes.
4. Production superintendent's salary.
5. Wages of laborers assembling a product.
6. Depreciation of air purification equipment used to make furniture.
7. Janitorial salaries.
8. Peaches used in canning fruit.
9. Lubricants for production equipment.
10. Sugar used in soft-drink production.
11. Property taxes on the factory.
12. Wages of workers painting a product.
13. Depreciation on cafeteria equipment.
14. Insurance on a building used in producing helicopters.
15. Cost of rotor blades used in producing helicopters.

CHECK FIGURE

(3) Cloth used: variable, direct

Required:

Classify each cost as either variable or fixed with respect to the number of units produced and sold. Also indicate whether each cost would typically be treated as a direct cost or an indirect cost with respect to units of product. Prepare your answer sheet as shown below:

Cost Item	Cost Behavior		To Units of Product	
	Variable	Fixed	Direct	Indirect
Example: Factory insurance		X		X

PROBLEM 1-16A Schedule of Cost of Goods Manufactured; Income Statement [LO2, LO3, LO4, LO5]

Swift Company was organized on March 1 of the current year. After five months of start-up losses, management had expected to earn a profit during August. Management was disappointed, however, when the income statement for August also showed a loss. August's income statement follows:

CHECK FIGURE

(1) Cost of goods manufactured: \$310,000

Sales		\$450,000
Less operating expenses:		
Direct labor cost	\$ 70,000	
Raw materials purchased	165,000	
Manufacturing overhead	85,000	
Selling and administrative expenses	<u>142,000</u>	<u>462,000</u>
Net operating loss		<u>\$ (12,000)</u>

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After seeing the \$12,000 loss for August, Swift's president stated, "I was sure we'd be profitable within six months, but our six months are up and this loss for August is even worse than July's. I think it's time to

start looking for someone to buy out the company's assets—if we don't, within a few months there won't be any assets to sell. By the way, I don't see any reason to look for a new controller. We'll just limp along with Sam for the time being.”

The company's controller resigned a month ago. Sam, a new assistant in the controller's office, prepared the income statement on the prior page. Sam has had little experience in manufacturing operations.

Inventory balances at the beginning and end of August were:

	August 1	August 31
Raw materials	\$8,000	\$13,000
Work in process	\$16,000	\$21,000
Finished goods	\$40,000	\$60,000

The president has asked you to check over the income statement and make a recommendation as to whether the company should look for a buyer for its assets.

Required:

1. As one step in gathering data for a recommendation to the president, prepare a schedule of cost of goods manufactured for August.
2. As a second step, prepare a new income statement for August.
3. Based on your statements prepared in (1) and (2) above, would you recommend that the company look for a buyer?



PROBLEM 1-17A Classification of Salary Cost as a Period or Product Cost [LO3]

You have just been hired by Ogden Company to fill a new position that was created in response to rapid growth in sales. It is your responsibility to coordinate shipments of finished goods from the factory to distribution warehouses located in various parts of the United States so that goods will be available as orders are received from customers.

The company is unsure how to classify your annual salary in its cost records. The company's cost analyst says that your salary should be classified as a manufacturing (product) cost; the controller says that it should be classified as a selling expense; and the president says that it doesn't matter which way your salary cost is classified.

Required:

1. Which viewpoint is correct? Why?
2. From the point of view of the reported net operating income for the year, is the president correct in his statement that it doesn't matter which way your salary cost is classified? Explain.

PROBLEM 1-18A Schedule of Cost of Goods Manufactured; Income Statement; Cost Behavior [LO2, LO3, LO4, LO5, LO6]

Various cost and sales data for Meriwell Company for the just completed year appear in the worksheet below:

CHECK FIGURE

- (1) Cost of goods manufactured:
\$290,000



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	A	B	C
1	Finished goods inventory, beginning	\$20,000	
2	Finished goods inventory, ending	\$40,000	
3	Administrative expenses	\$110,000	
4	Manufacturing overhead	\$105,000	
5	Purchases of raw materials	\$125,000	
6	Raw materials inventory, beginning	\$9,000	
7	Raw materials inventory, ending	\$6,000	
8	Direct labor	\$70,000	
9	Work in process inventory, beginning	\$17,000	
10	Work in process inventory, ending	\$30,000	
11	Sales	\$500,000	
12	Selling expenses	\$80,000	
13			

Of the \$105,000 of manufacturing overhead, \$15,000 is variable and \$90,000 is fixed.

Required:

1. Prepare a schedule of cost of goods manufactured.
2. Prepare an income statement.
3. Assume that the company produced the equivalent of 10,000 units of product during the year just completed. What was the average cost per unit for direct materials? What was the average cost per unit for fixed manufacturing overhead?
4. Assume that the company expects to produce 15,000 units of product during the coming year. What average cost per unit and what total cost would you expect the company to incur for direct materials at this level of activity? For fixed manufacturing overhead? Assume that direct materials is a variable cost.
5. As the manager responsible for production costs, explain to the president any difference in the average costs per unit between (3) and (4) above.

PROBLEM I-19A Cost Classification and Cost Behavior [LO3, LO6, LO7]

The Dorilane Company specializes in producing a set of wood patio furniture consisting of a table and four chairs. The set enjoys great popularity, and the company has ample orders to keep production going at its full capacity of 2,000 sets per year. Annual cost data at full capacity follow:

Factory labor, direct	\$118,000
Advertising	\$50,000
Factory supervision	\$40,000
Property taxes, factory building	\$3,500
Sales commissions	\$80,000
Insurance, factory	\$2,500
Depreciation, administrative office equipment	\$4,000
Lease cost, factory equipment	\$12,000
Indirect materials, factory	\$6,000
Depreciation, factory building	\$10,000
Administrative office supplies (billing)	\$3,000
Administrative office salaries	\$60,000
Direct materials used (wood, bolts, etc.)	\$94,000
Utilities, factory	\$20,000

CHECK FIGURE

(1) Total variable cost:
\$321,000



Required:

1. Prepare an answer sheet with the column headings shown below. Enter each cost item on your answer sheet, placing the dollar amount under the appropriate headings. As examples, this has been done already for the first two items in the list above. Note that each cost item is classified in two ways: first, as variable or fixed with respect to the number of units produced and sold; and second, as a selling and administrative cost or a product cost. (If the item is a product cost, it should also be classified as either direct or indirect as shown.)

Cost Item	Cost Behavior		Selling or Administrative Cost	Product Cost	
	Variable	Fixed		Direct	Indirect*
Factory labor, direct	\$118,000			\$118,000	
Advertising		\$50,000	\$50,000		

*To units of product.

2. Total the dollar amounts in each of the columns in (1) above. Compute the average product cost of one patio set.
3. Assume that production drops to only 1,000 sets annually. Would you expect the average product cost per set to increase, decrease, or remain unchanged? Explain. No computations are necessary.

4. Refer to the original data. The president's brother-in-law has considered making himself a patio set and has priced the necessary materials at a building supply store. The brother-in-law has asked the president if he could purchase a patio set from the Dorilanc Company "at cost," and the president agreed to let him do so.
 - a. Would you expect any disagreement between the two men over the price the brother-in-law should pay? Explain. What price does the president probably have in mind? The brother-in-law?
 - b. Because the company is operating at full capacity, what cost term used in the chapter might be justification for the president to charge the full, regular price to the brother-in-law and still be selling "at cost"?

CHECK FIGURE

Clay and glaze: variable, direct materials



PROBLEM 1-20A Classification of Various Costs [LO2, LO3, LO6, LO8]

Staci Valek began dabbling in pottery several years ago as a hobby. Her work is quite creative, and it has been so popular with friends and others that she has decided to quit her job with an aerospace company and manufacture pottery full time. The salary from Staci's aerospace job is \$3,800 per month.

Staci will rent a small building near her home to use as a place for manufacturing the pottery. The rent will be \$500 per month. She estimates that the cost of clay and glaze will be \$2 for each finished piece of pottery. She will hire workers to produce the pottery at a labor rate of \$8 per pot. To sell her pots, Staci feels that she must advertise heavily in the local area. An advertising agency states that it will handle all advertising for a fee of \$600 per month. Staci's brother will sell the pots; he will be paid a commission of \$4 for each pot sold. Equipment needed to manufacture the pots will be rented at a cost of \$300 per month.

Staci has already paid the legal and filing fees associated with incorporating her business in the state. These fees amounted to \$500. A small room has been located in a tourist area that Staci will use as a sales office. The rent will be \$250 per month. A phone installed in the room for taking orders will cost \$40 per month. In addition, a recording device will be attached to the phone for taking after-hours messages.

Staci has some money in savings that is earning interest of \$1,200 per year. These savings will be withdrawn and used to get the business going. For the time being, Staci does not intend to draw any salary from the new company.

Required:

1. Prepare an answer sheet with the following column headings:

Name of the Cost	Product Cost					Period (Selling and Administrative) Cost	Opportunity Cost	Sunk Cost
	Variable Cost	Fixed Cost	Direct Materials	Direct Labor	Manufacturing Overhead			

List the different costs associated with the new company down the extreme left column (under Name of Cost). Then place an X under each heading that helps to describe the type of cost involved. There may be X's under several column headings for a single cost. (That is, a cost may be a fixed cost, a period cost, and a sunk cost; you would place an X under each of these column headings opposite the cost.)

Under the Variable Cost column, list only those costs that would be variable with respect to the number of units of pottery that are produced and sold.

2. All of the costs you have listed above, except one, would be differential costs between the alternatives of Staci producing pottery or staying with the aerospace company. Which cost is *not* differential? Explain.

PROBLEM 1-21A Schedule of Cost of Goods Manufactured; Income Statement; Cost Behavior [LO2, LO3, LO4, LO5, LO6]

Selected account balances for the year ended December 31 are provided below for Superior Company:

CHECK FIGURE

(1) Cost of goods manufactured: \$690,000



Selling and administrative salaries	\$110,000
Purchases of raw materials	\$290,000
Direct labor	?
Advertising expense	\$80,000
Manufacturing overhead.....	\$270,000
Sales commissions	\$50,000

Inventory balances at the beginning and end of the year were as follows:

	Beginning of the Year	End of the Year
Raw materials.....	\$40,000	\$10,000
Work in process.....	?	\$35,000
Finished goods	\$50,000	?

The total manufacturing costs for the year were \$683,000; the goods available for sale totaled \$740,000; and the cost of goods sold totaled \$660,000.

Required:

1. Prepare a schedule of cost of goods manufactured and the cost of goods sold section of the company's income statement for the year.
2. Assume that the dollar amounts given above are for the equivalent of 40,000 units produced during the year. Compute the average cost per unit for direct materials used and the average cost per unit for manufacturing overhead.
3. Assume that in the following year the company expects to produce 50,000 units and manufacturing overhead is fixed. What average cost per unit and total cost would you expect to be incurred for direct materials? For manufacturing overhead? (Assume that direct materials is a variable cost.)
4. As the manager in charge of production costs, explain to the president the reason for any difference in average cost per unit between (2) and (3) above.

PROBLEM I-22A Working with Incomplete Data from the Income Statement and Schedule of Cost of Goods Manufactured [LO4, LO5]

Supply the missing data in the following cases. Each case is independent of the others.

CHECK FIGURE
(Case 1) Goods available for sale: \$19,000

	Case			
	1	2	3	4
Schedule of Cost of Goods Manufactured				
Direct materials.....	\$4,500	\$6,000	\$5,000	\$3,000
Direct labor	?	\$3,000	\$7,000	\$4,000
Manufacturing overhead.....	\$5,000	\$4,000	?	\$9,000
Total manufacturing costs	\$18,500	?	\$20,000	?
Beginning work in process inventory	\$2,500	?	\$3,000	?
Ending work in process inventory.....	?	\$1,000	\$4,000	\$3,000
Cost of goods manufactured	\$18,000	\$14,000	?	?
Income Statement				
Sales.....	\$30,000	\$21,000	\$36,000	\$40,000
Beginning finished goods inventory.....	\$1,000	\$2,500	?	\$2,000
Cost of goods manufactured	\$18,000	\$14,000	?	\$17,500
Goods available for sale	?	?	?	?
Ending finished goods inventory.....	?	\$1,500	\$4,000	\$3,500
Cost of goods sold.....	\$17,000	?	\$18,500	?
Gross margin	\$13,000	?	\$17,500	?
Selling and administrative expenses	?	\$3,500	?	?
Net operating income	\$4,000	?	\$5,000	\$9,000

BUILDING YOUR SKILLS

CHECK FIGURE

- (1) Cost of goods manufactured:
\$870,000



ANALYTICAL THINKING [LO2, LO3, LO4, LO5]

Visic Corporation, a manufacturing company, produces a single product. The following information has been taken from the company's production, sales, and cost records for the just completed year.

Production in units	29,000
Sales in units	?
Ending finished goods inventory in units	?
Sales in dollars	\$1,300,000
Costs:	
Direct labor	\$90,000
Raw materials purchased	\$480,000
Manufacturing overhead	\$300,000
Selling and administrative expenses	\$380,000

	Beginning of the Year	End of the Year
Inventories:		
Raw materials	\$20,000	\$30,000
Work in process	\$50,000	\$40,000
Finished goods	\$0	?

The finished goods inventory is being carried at the average unit production cost for the year. The selling price of the product is \$50 per unit.

Required:

1. Prepare a schedule of cost of goods manufactured for the year.
2. Compute the following:
 - a. The number of units in the finished goods inventory at the end of the year.
 - b. The cost of the units in the finished goods inventory at the end of the year.
3. Prepare an income statement for the year.



ETHICS CHALLENGE [LO3]

M. K. Gallant is president of Kranbrack Corporation, a company whose stock is traded on a national exchange. In a meeting with investment analysts at the beginning of the year, Gallant had predicted that the company's earnings would grow by 20% this year. Unfortunately, sales have been less than expected for the year, and Gallant concluded within two weeks of the end of the fiscal year that it would be impossible to ultimately report an increase in earnings as large as predicted unless some drastic action was taken. Accordingly, Gallant has ordered that wherever possible, expenditures should be postponed to the new year—including canceling or postponing orders with suppliers, delaying planned maintenance and training, and cutting back on end-of-year advertising and travel. Additionally, Gallant ordered the company's controller to carefully scrutinize all costs that are currently classified as period costs and reclassify as many as possible as product costs. The company is expected to have substantial inventories of work in process and finished goods at the end of the year.

Required:

1. Why would reclassifying period costs as product costs increase this period's reported earnings?
2. Do you believe Gallant's actions are ethical? Why or why not?

CASE [LO4, LO5]

Hector P. Wastrel, a careless employee, left some combustible materials near an open flame in Salter Company's plant. The resulting explosion and fire destroyed the entire plant and administrative offices. Justin Quick, the company's controller, and Constance Trueheart, the operations manager, were able to save only a few bits of information as they escaped from the roaring blaze.

“What a disaster,” cried Justin. “And the worst part is that we have no records to use in filing an insurance claim.”

“I know,” replied Constance. “I was in the plant when the explosion occurred, and I managed to grab only this brief summary sheet that contains information on one or two of our costs. It says that our direct labor cost this year totaled \$180,000 and that we purchased \$290,000 in raw materials. But I’m afraid that doesn’t help much; the rest of our records are just ashes.”

“Well, not completely,” said Justin. “I was working on the year-to-date income statement when the explosion knocked me out of my chair. I instinctively held onto the page I was working on, and from what I can make out, our sales to date this year totaled \$1,200,000 and our gross margin was 40% of sales. Also, I can see that our goods available for sale to customers totaled \$810,000 at cost.”

“Maybe we’re not so bad off after all,” exclaimed Constance. “My sheet says that prime cost totaled \$410,000 so far this year and that manufacturing overhead is 70% of conversion cost. Now if we just had some information on our beginning inventories.”

“Hey, look at this,” cried Justin. “It’s a copy of last year’s annual report, and it shows what our inventories were when this year started. Let’s see, raw materials was \$18,000, work in process was \$65,000, and finished goods was \$45,000.”

“Super,” yelled Constance. “Let’s go to work.”

To file an insurance claim, the company must determine the amount of cost in its inventories as of the date of the fire. You may assume that all materials used in production during the year were direct materials.

Required:

Determine the amount of cost in the Raw Materials, Work in Process, and Finished Goods inventory accounts as of the date of the fire. (Hint: One way to proceed would be to reconstruct the various schedules and statements that would have been affected by the company’s inventory accounts during the period.)

TEAMWORK IN ACTION [LO6]

Understanding the nature of fixed and variable costs is extremely important to managers. This knowledge is used in planning, making strategic and tactical decisions, evaluating performance, and controlling operations.



Required:

Form a team consisting of four persons. Each team member will be responsible for one of the following businesses:

- a. Retail store that sells music CDs
 - b. Dental clinic
 - c. Fast-food restaurant
 - d. Auto repair shop
1. In each business decide what single measure best reflects the overall level of activity in the business and give examples of costs that are fixed and variable with respect to small changes in the measure of activity you have chosen.
 2. Explain the relationship between the level of activity in each business and each of the following: total fixed costs, fixed cost per unit of activity, total variable costs, variable cost per unit of activity, total costs, and average total cost per unit of activity.
 3. Discuss and refine your answers to each of the above questions with your group. Which of the above businesses seems to have the highest ratio of variable to fixed costs? The lowest? Which of the businesses’ profits would be most sensitive to changes in demand for its services? The least sensitive? Why?



RESEARCH AND APPLICATION

[L02, L03, L06, L07]

The questions in this exercise are based on **Dell, Inc.** To answer the questions, you will need to download Dell’s Form 10-K for the fiscal year ended January 28, 2005 by going to www.sec.gov/edgar/searchedgar/companysearch.html. Input CIK code 826083 and hit enter. In the gray box on the right-hand side of your computer screen define the scope of your search by inputting 10-K and then pressing enter. Select the 10-K with a filing date of March 8, 2005. You do not need to print this document in order to answer the questions.



Required:

1. What is Dell's strategy for success in the marketplace? Does the company rely primarily on a customer intimacy, operational excellence, or product leadership customer value proposition? What evidence supports your conclusion?
2. What business risks does Dell face that may threaten its ability to satisfy stockholder expectations? What are some examples of control activities that the company could use to reduce these risks? (Hint: Focus on pages 7–10 of the 10-K.)
3. How has the Sarbanes-Oxley Act of 2002 explicitly affected the disclosures contained in Dell's 10-K report? (Hint: Focus on pages 34–35, 59, and 76–78.)
4. Is Dell a merchandiser or a manufacturer? What information contained in the 10-K supports your answer?
5. What are some examples of direct and indirect inventoriable costs for Dell? Why has Dell's gross margin (in dollars) steadily increased from 2003 to 2005, yet the gross margin as a percent of net revenue has only increased slightly?
6. What is the inventory balance on Dell's January 28, 2005, balance sheet? Why is the inventory balance so small compared to the other current asset balances? What competitive advantage does Dell derive from its low inventory levels? Page 27 of Dell's 10-K reports a figure called the cash conversion cycle. The cash conversion cycle for Dell has consistently been negative. Is this a good sign for Dell or a bad sign? Why?
7. Describe some of the various types of operating expenses incurred by Dell. Why are these expenses treated as period costs?
8. List four different cost objects for Dell. For each cost object, mention one example of a direct cost and an indirect cost.

2

Systems Design: Job-Order Costing

<< A LOOK BACK

Chapter 1 described the three major activities of managers and compared and contrasted financial and managerial accounting. It also defined many of the terms that are used to classify costs in business. We will use many of these terms in Chapter 2. Now would be a good time to check your understanding of those terms by referring to the glossary at the end of Chapter 1.

A LOOK AT THIS CHAPTER

Chapter 2 distinguishes between two costing systems, job-order and process costing, and then provides an in-depth look at a job-order costing system. We describe how direct material and direct labor costs are accumulated on jobs. Then we address manufacturing overhead, an indirect cost that must be allocated (or applied) to jobs. Finally, we take a more detailed look at the flow of costs through a company's accounting system using journal entries.

A LOOK AHEAD >>

Chapter 3 continues the discussion of the allocation of manufacturing overhead costs, showing how these costs can be more accurately assigned using activity-based costing. We cover process costing in Chapter 4.

CHAPTER OUTLINE

Process and Job-Order Costing

- Process Costing
- Job-Order Costing

Job-Order Costing—An Overview

- Measuring Direct Materials Cost
- Job Cost Sheet
- Measuring Direct Labor Cost
- Applying Manufacturing Overhead
- Using the Predetermined Overhead Rate
- The Need for a Predetermined Rate
- Choice of an Allocation Base for Overhead Cost
- Computation of Unit Costs
- Summary of Document Flows

Job-Order Costing—The Flow of Costs

- The Purchase and Issue of Materials
- Labor Cost

- Manufacturing Overhead Costs
- Applying Manufacturing Overhead
- Nonmanufacturing Costs
- Cost of Goods Manufactured
- Cost of Goods Sold
- Summary of Cost Flows

Problems of Overhead Application

- Underapplied and Overapplied Overhead
- Disposition of Underapplied or Overapplied Overhead Balances
- A General Model of Product Cost Flows
- Multiple Predetermined Overhead Rates

Job-Order Costing in Service Companies



LEARNING OBJECTIVES



After studying Chapter 2, you should be able to:

LO1 Distinguish between process costing and job-order costing and identify companies that would use each costing method.

LO2 Identify the documents used in a job-order costing system.

LO3 Compute predetermined overhead rates and explain why estimated overhead costs (rather than actual overhead costs) are used in the costing process.

LO4 Understand the flow of costs in a job-order costing system and prepare appropriate journal entries to record costs.

LO5 Apply overhead cost to Work in Process using a predetermined overhead rate.

LO6 Prepare schedules of cost of goods manufactured and cost of goods sold.

LO7 Use T-accounts to show the flow of costs in a job-order costing system.

LO8 Compute underapplied or overapplied overhead cost and prepare the journal entry to close the balance in Manufacturing Overhead to the appropriate accounts.

Two College Students Succeeding as Entrepreneurs

When the University of Dayton athletic department needed 2,000 customized T-shirts to give away as part of a promotion for its first home basketball game of the year, it chose **University Tees** to provide the shirts. Numerous larger competitors could have been chosen, but University Tees won the order because of its fast customer response time, low price, and high quality.

University Tees is a small business that was started in February 2003 by two Miami University seniors—Joe Haddad and Nick Dadas (see the company's website at www.universitytees.com). The company creates the artwork for customized T-shirts and then relies on carefully chosen suppliers to manufacture the product. University Tees must provide a specific price quote for each potential customer order because each order is unique and the customer is always looking for the best deal.

Calculating the cost of a particular customer order is critically important to University Tees because the company needs to be sure that each price quote exceeds the cost associated with satisfying the order. The costs that University Tees factors into its bidding process include the cost of the T-shirts themselves, printing costs (which vary depending on the quantity of shirts produced and the number of colors printed per shirt), silk screen costs (which also vary depending on the number of colors included in a design), shipping costs, and the artwork needed to create a design. In addition to using cost information, the company also relies on knowledge of its competitors' pricing strategies when establishing price quotes.

Source: Conversation with Joe Haddad, cofounder of University Tees.

Understanding how products and services are costed is vital to managers because the way in which these costs are determined can have a substantial impact on reported profits, as well as on key management decisions.

A managerial costing system should provide cost data to help managers plan, direct and motivate, control, and make decisions. Nevertheless, external financial reporting and tax reporting requirements often heavily influence how costs are accumulated and summarized on managerial reports. This is true of product costing. In the last chapter and in this chapter we use *absorption costing* to determine product costs. In **absorption costing**, all manufacturing costs, both fixed and variable, are assigned to units of product—units are said to *fully absorb manufacturing costs*. In later chapters we look at alternatives to absorption costing such as activity-based costing and variable costing.

Most countries—including the United States—require some form of absorption costing for both external financial reports and for tax reports. In addition, the vast majority of companies throughout the world also use absorption costing in their management reports. Because absorption costing is the most common approach to product costing throughout the world, we discuss it first and then discuss the alternatives in subsequent chapters.

PROCESS AND JOB-ORDER COSTING

LEARNING OBJECTIVE 1

Distinguish between process costing and job-order costing and identify companies that would use each costing method.



Under absorption costing, product costs include all manufacturing costs. Some manufacturing costs, such as direct materials, can be directly traced to particular products. For example, the cost of the airbags installed in a **Toyota** Camry can be easily traced to that particular auto. But what about manufacturing costs like factory rent? Such costs do not change from month to month, whereas the number and variety of products made in the factory may vary dramatically from one month to the next. Since these costs remain unchanged from month to month regardless of what products are made, they are clearly not caused by—and cannot be directly traced to—any particular product. Therefore, these types of costs are assigned to products and services by averaging across time and across products. The type of production process influences how this averaging is done. We discuss two different costing systems in the sections that follow—*process costing* and *job-order costing*.

Process Costing

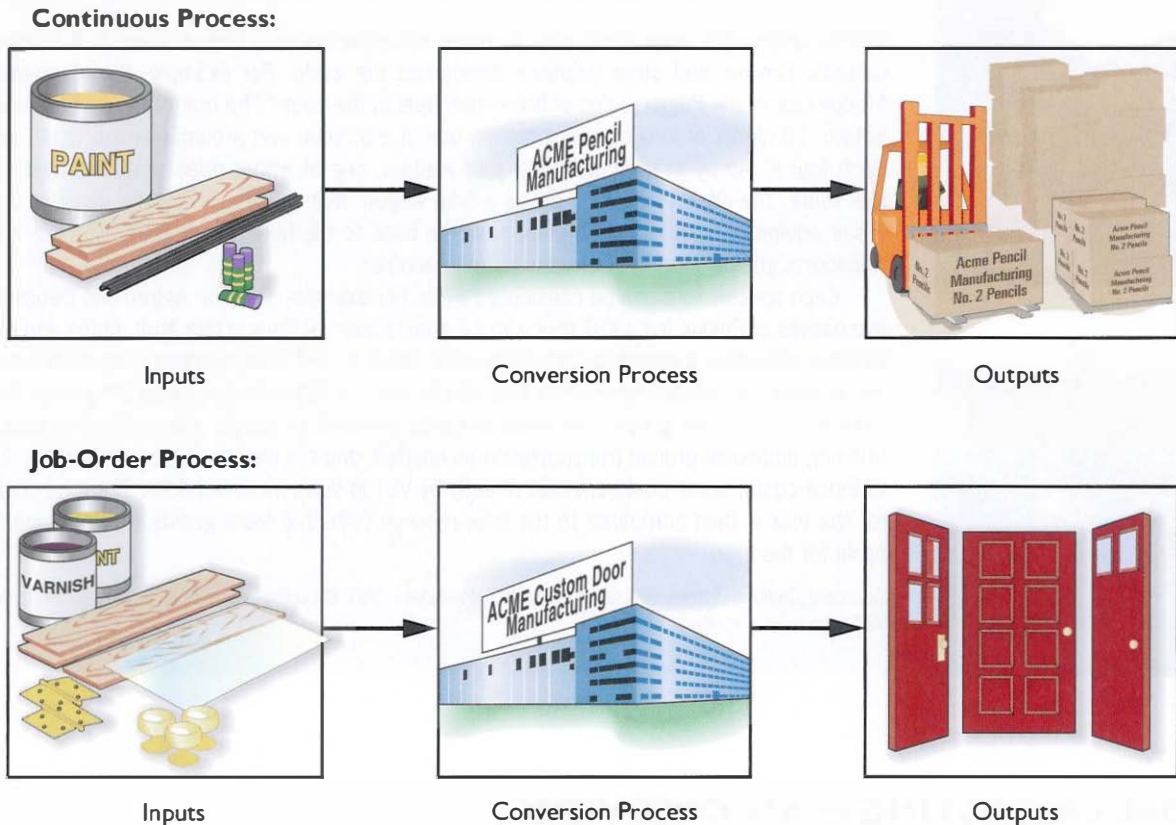
Process costing is used in companies that produce many units of a single product for long periods. Examples include producing paper at **Weyerhaeuser**, refining aluminum ingots at **Reynolds Aluminum**, mixing and bottling beverages at **Coca-Cola**, and making wieners at **Oscar Mayer**. These are all homogeneous products that flow through the production process on a continuous basis.

Process costing systems accumulate costs in a particular operation or department for an entire period (month, quarter, year) and then divide this total cost by the number of units produced during the period. The basic formula for process costing is:

$$\text{Unit product cost} = \frac{\text{Total manufacturing cost}}{\text{Total units produced}}$$

Because one unit is indistinguishable from any other unit of a product, each unit produced during the period is assigned the same average cost. This costing technique results in a broad, average unit cost figure that applies to homogeneous units flowing in a continuous stream out of the production process.

Continuous Process Manufacturing vs. Job-Order Manufacturing



Job-Order Costing

Job-order costing is used in situations where many *different* products are produced each period. For example, a **Levi Strauss** clothing factory would typically make many different types of jeans for both men and women during a month. A particular order might consist of 1,000 stonewashed men's blue denim jeans, style number A312. This order of 1,000 jeans is called a *job*. In a job-order costing system, costs are traced and allocated to jobs and then the costs of the job are divided by the number of units in the job to arrive at an average cost per unit.

Other examples of situations where job-order costing would be used include large-scale construction projects managed by **Bechtel International**, commercial aircraft produced by **Boeing**, greeting cards designed and printed by **Hallmark**, and airline meals prepared by **LSG SkyChefs**. All of these examples are characterized by diverse outputs. Each Bechtel project is unique and different from every other—the company may be simultaneously constructing a dam in Zaire and a bridge in Indonesia. Likewise, each airline orders a different type of meal from LSG SkyChefs' catering service.

Job-order costing is also used extensively in service industries. For example, hospitals, law firms, movie studios, accounting firms, advertising agencies, and repair shops all use a variation of job-order costing to accumulate costs. Although the detailed example of job-order costing provided in the following section deals with a manufacturing company, the same basic concepts and procedures are used by many service organizations.

In this chapter, we focus on the design of a job-order costing system. In chapter 4, we focus on process costing and also look more closely at the similarities and differences between the two costing methods.



IN BUSINESS

Is This Really A Job?



VBT Bicycling Vacations of Bristol, Vermont, offers deluxe bicycling vacations in the United States, Canada, Europe, and other locations throughout the world. For example, the company offers a 10-day tour of the Puglia region of Italy—the “heel of the boot.” The tour price includes international airfare, 10 nights of lodging, most meals, use of a bicycle, and ground transportation as needed. Each tour is led by at least two local tour leaders, one of whom rides with the guests along the tour route. The other tour leader drives a “sag wagon” that carries extra water, snacks, and bicycle repair equipment and is available for a shuttle back to the hotel or up a hill. The sag wagon also transports guests’ luggage from one hotel to another.

Each specific tour can be considered a job. For example, Giuliano Astore and Debora Trippetti, two natives of Puglia, led a VBT tour with 17 guests over 10 days in late April. At the end of the tour, Giuliano submitted a report, a sort of job cost sheet, to VBT headquarters. This report detailed the on the ground expenses incurred for this specific tour, including fuel and operating costs for the van, lodging costs for the guests, the costs of meals provided to guests, the costs of snacks, the cost of hiring additional ground transportation as needed, and the wages of the tour leaders. In addition to these costs, some costs are paid directly by VBT in Vermont to vendors. The total cost incurred for the tour is then compared to the total revenue collected from guests to determine the gross profit for the tour.

Sources: Giuliano Astore and Gregg Marston, President, VBT Bicycling Vacations. For more information about VBT, see www.vbt.com.

JOB-ORDER COSTING—AN OVERVIEW

LEARNING OBJECTIVE 2

Identify the documents used in a job-order costing system.



To introduce job-order costing, we will follow a specific job as it progresses through the manufacturing process. This job consists of two experimental couplings that Yost Precision Machining has agreed to produce for Loops Unlimited, a manufacturer of roller coasters. Couplings connect the cars on the roller coaster and are a critical component in the performance and safety of the ride. Before we begin our discussion, recall from the previous chapter that companies generally classify manufacturing costs into three broad categories: (1) direct materials, (2) direct labor, and (3) manufacturing overhead. As we study the operation of a job-order costing system, we will see how each of these three types of costs is recorded and accumulated.

MANAGERIAL
ACCOUNTING IN
ACTION

The Issue

Yost Precision Machining is a small company in Michigan that specializes in fabricating precision metal parts that are used in a variety of applications ranging from deep-sea exploration vehicles to the inertial triggers in automobile air bags. The company’s top managers gather every morning at 8:00 A.M. in the company’s conference room for the daily planning meeting. Attending the meeting this morning are: Jean Yost, the company’s president; David Chung, the marketing manager; Debbie Turner, the production manager; and Marc White, the company controller. The president opened the meeting:

Jean: The production schedule indicates we’ll be starting Job 2B47 today. Isn’t that the special order for experimental couplings, David?

David: That’s right. That’s the order from Loops Unlimited for two couplings for their new roller coaster ride for Magic Mountain.

Debbie: Why only two couplings? Don’t they need a coupling for every car?



David: Yes. But this is a completely new roller coaster. The cars will go faster and will be subjected to more twists, turns, drops, and loops than on any other existing roller coaster. To hold up under these stresses, Loops Unlimited's engineers completely redesigned the cars and couplings. They want us to make just two of these new couplings for testing purposes. If the design works, then we'll have the inside track on the order to supply couplings for the whole ride.

Jean: We agreed to take on this initial order at our cost just to get our foot in the door. Marc, will there be any problem documenting our cost so we can get paid?

Marc: No problem. The contract with Loops stipulates that they will pay us an amount equal to our cost of goods sold. With our job-order costing system, I can tell you the cost on the day the job is completed.

Jean: Good. Is there anything else we should discuss about this job at this time? No? Well then let's move on to the next item of business.

Measuring Direct Materials Cost

Each experimental coupling for Loops Unlimited will require three parts that are classified as direct materials: two G7 Connectors and one M46 Housing. This is a custom product that is being made for the first time, but if this were one of the company's standard products, it would have an established *bill of materials*. A **bill of materials** is a document that lists the type and quantity of each type of direct material needed to complete a unit of product. In this case, there is no established bill of materials, so Yost's production staff determined the materials requirements from the blueprints submitted by the customer. Each coupling requires two connectors and one housing, so to make two couplings, four connectors and two housings are required.

When an agreement has been reached with the customer concerning the quantities, prices, and shipment date for the order, a *production order* is issued. The Production Department then prepares a *materials requisition form* similar to the form in Exhibit 2-1. The **materials requisition form** is a document that specifies the type and quantity of materials to be drawn from the storeroom and identifies the job that will be charged for the cost of the materials. The form is used to control the flow of materials into production and also for making entries in the accounting records.

The Yost Precision Machining materials requisition form in Exhibit 2-1 shows that the company's Milling Department has requisitioned two M46 Housings and four G7

EXHIBIT 2-1
Materials Requisition Form

Materials Requisition Number <u>14873</u>		Date <u>March 2</u>	
Job Number to Be Charged <u>2B47</u>			
Department <u>Milling</u>			
Description	Quantity	Unit Cost	Total Cost
M46 Housing	2	\$124	\$248
G7 Connector	4	\$103	<u>412</u>
			\$660
Authorized Signature <u>Bill White</u>			

Connectors for the Loops Unlimited job, which has been designated as Job 2B47. A production worker presents the completed form to the storeroom clerk who then issues the specified materials to the worker. The storeroom clerk is not allowed to release materials without a completed and properly authorized materials requisition form.

Job Cost Sheet

After being notified that the production order has been issued, the Accounting Department prepares a *job cost sheet* like the one presented in Exhibit 2–2. A **job cost sheet** is a form prepared for a job that records the materials, labor, and manufacturing overhead costs charged to that job.

After direct materials are issued, the Accounting Department records their costs on the job cost sheet. Note from Exhibit 2–2, for example, that the \$660 cost for direct materials shown earlier on the materials requisition form has been charged to Job 2B47 on its job cost sheet. The requisition number 14873 from the materials requisition form is also recorded on the job cost sheet to make it easier to identify the source document for the direct materials charge.

Measuring Direct Labor Cost

Direct labor cost is handled similarly to direct materials cost. Direct labor consists of labor charges that are easily traced to a particular job. Labor charges that cannot be easily traced directly to any job are treated as part of manufacturing overhead. As discussed in the previous chapter, this latter category of labor costs is called *indirect labor* and includes tasks such as maintenance, supervision, and cleanup.

EXHIBIT 2-2
Job Cost Sheet

JOB COST SHEET

Job Number 2B47 Date Initiated March 2
 Date Completed _____
 Department Milling Units Completed _____
 Item Special order coupling
 For Stock _____

Direct Materials		Direct Labor			Manufacturing Overhead		
Req. No.	Amount	Ticket	Hours	Amount	Hours	Rate	Amount
14873	\$660	843	5	\$45			

Cost Summary		Units Shipped		
	\$	Date	Number	Balance
Direct Materials	\$			
Direct Labor	\$			
Manufacturing Overhead	\$			
Total Cost	\$			
Unit Product Cost	\$			

EXHIBIT 2-3
Employee Time Ticket

Time Ticket No. 843		Date <u>March 3</u>			
Employee <u>Mary Holden</u>		Station <u>4</u>			
Started	Ended	Time Completed	Rate	Amount	Job Number
7:00	12:00	5.0	\$9	\$45	2B47
12:30	2:30	2.0	9	18	2B50
2:30	3:30	1.0	9	9	Maintenance
Totals		8.0		\$72	

Supervisor R.W. Pace

Workers use *time tickets* to record the time they spend on each job and task. A completed **time ticket** is an hour-by-hour summary of the employee's activities throughout the day. An example of an employee time ticket is shown in Exhibit 2-3. When working on a specific job, the employee enters the job number on the time ticket and notes the amount of time spent on that job. When not assigned to a particular job, the employee records the nature of the indirect labor task (such as cleanup and maintenance) and the amount of time spent on the task.

At the end of the day, the time tickets are gathered and the Accounting Department calculates the wage cost for each entry on the time ticket and then enters the direct labor-hours and costs on individual job cost sheets. (See Exhibit 2-2 for an example of how direct labor costs are entered on the job cost sheet.)

The system we have just described is a manual method for recording and posting labor costs. Today many companies rely on computerized systems and no longer record labor time by hand on sheets of paper. One computerized approach uses bar codes to capture data. Each employee and each job has a unique bar code. When beginning work on a job, the employee scans three bar codes using a handheld device much like the bar code readers at grocery store checkout stands. The first bar code indicates that a job is being started; the second is the unique bar code on the employee's identity badge; and the third is the unique bar code of the job itself. This information is fed automatically via an electronic network to a computer that notes the time and records all of the data. When the task is completed, the employee scans a bar code indicating the task is complete, the bar code on his or her identity badge, and the bar code attached to the job. This information is relayed to the computer that again notes the time, and a time ticket is automatically prepared. Because all of the source data is already in computer files, the labor costs can be automatically posted to job cost sheets (or their electronic equivalents). Computers, coupled with technology such as bar codes, can eliminate much of the drudgery involved in routine bookkeeping activities while at the same time increasing timeliness and accuracy.

Bucking The Trend: Using People Instead of Machines

IN BUSINESS

For decades overhead costs have been going up and labor costs have been going down as companies have replaced people with machines. However, at the French automaker **Renault**, the exact opposite has been happening with its new, no-frills vehicle called the Logan. The Logan was intentionally stripped of costly elements and unnecessary technology so that the car could be sold for \$6,000 in emerging Eastern European markets. The car's simplified design enables Renault's

(continued)

manufacturing plant in Romania to assemble the car almost entirely with people instead of robots. The monthly pay for a line worker at Renault's Romanian plant is \$324 versus an average of more than \$4,700 per worker in Western European countries. Thanks in part to low-cost labor, Logan's production costs are estimated to be just \$1,089 per unit.

The Logan is finding buyers not only in emerging markets but also in more advanced Western European nations where customers have been clamoring for the car. Renault expects sales for the Logan to climb to one million vehicles by 2010—adding \$341 million to its profits.

Source: Gail Edmondson and Constance Fuvre d'Arcier, "Got 5,000 Euros? Need a New Car?" *BusinessWeek*, July 4, 2005, p. 49.

LEARNING OBJECTIVE 3

Compute predetermined overhead rates and explain why estimated overhead costs (rather than actual overhead costs) are used in the costing process.



Applying Manufacturing Overhead

Recall that product costs include manufacturing overhead as well as direct materials and direct labor. Therefore, manufacturing overhead also needs to be recorded on the job cost sheet. However, assigning manufacturing overhead to a specific job involves some difficulties. There are three reasons for this:

1. Manufacturing overhead is an *indirect cost*. This means that it is either impossible or difficult to trace these costs to a particular product or job.
2. Manufacturing overhead consists of many different items ranging from the grease used in machines to the annual salary of the production manager.
3. Because of the fixed costs in manufacturing overhead, total manufacturing overhead costs tend to remain relatively constant from one period to the next even though the number of units produced can fluctuate widely. Consequently, the average cost per unit will vary from one period to the next.

Given these problems, allocation is used to assign overhead costs to products. Allocation is accomplished by selecting an *allocation base* that is common to all of the company's products and services. An **allocation base** is a measure such as direct labor-hours (DLH) or machine-hours (MH) that is used to assign overhead costs to products and services. The most widely used allocation bases in manufacturing are direct labor-hours, direct labor cost, machine-hours and (where a company has only a single product) units of product.

Manufacturing overhead is commonly applied to products using a *predetermined overhead rate*. The **predetermined overhead rate** is computed by dividing the total estimated manufacturing overhead cost for the period by the estimated total amount of the allocation base as follows:

$$\text{Predetermined overhead rate} = \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total amount of the allocation base}}$$

The predetermined overhead rate is computed before the period begins. The first step is to estimate the amount of the allocation base that will be required to support operations in the upcoming period. The second step is to estimate the total manufacturing cost at that level of activity. The third step is to compute the predetermined overhead rate. We will have more to say about the first and second steps in subsequent chapters. In this chapter we will assume that the total amount of the allocation base and the total manufacturing overhead costs have already been estimated.

To repeat, the predetermined overhead rate is computed *before* the period begins. The predetermined overhead rate is then used to apply overhead cost to jobs throughout the

period. The process of assigning overhead cost to jobs is called **overhead application**. The formula for determining the amount of overhead cost to apply to a particular job is:

$$\text{Overhead applied to a particular job} = \text{Predetermined overhead rate} \times \text{Amount of the allocation base incurred by the job}$$

For example, if the predetermined overhead rate is \$8 per direct labor-hour, then \$8 of overhead cost is *applied* to a job for each direct labor-hour incurred on the job. When the allocation base is direct labor-hours, the formula becomes:

$$\text{Overhead applied to a particular job} = \text{Predetermined overhead rate} \times \text{Actual direct labor-hours charged to the job}$$

Using the Predetermined Overhead Rate

To illustrate the steps involved in computing and using a predetermined overhead rate, let's return to Yost Precision Machining. The company has estimated that 40,000 direct labor-hours would be required to support the production planned for the year and that the total manufacturing overhead costs would be \$320,000 at that level of activity. Consequently, its predetermined overhead rate for the year would be \$8 per direct labor-hour, as shown below:

$$\begin{aligned} \text{Predetermined overhead rate} &= \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total amount of the allocation base}} \\ &= \frac{\$320,000}{40,000 \text{ direct labor-hours}} \\ &= \$8 \text{ per direct labor-hour} \end{aligned}$$

The job cost sheet in Exhibit 2-4 indicates that 27 direct labor-hours (i.e., DLHs) were charged to Job 2B47. Therefore, a total of \$216 of manufacturing overhead cost would be applied to the job:

$$\begin{aligned} \text{Overhead applied to Job 2B47} &= \text{Predetermined overhead rate} \times \text{Actual direct labor-hours charged to Job 2B47} \\ &= \$8 \text{ per DLH} \times 27 \text{ DLHs} \\ &= \$216 \text{ of overhead applied to Job 2B47} \end{aligned}$$

This amount of overhead has been entered on the job cost sheet in Exhibit 2-4. Note that this is *not* the actual amount of overhead caused by the job. Actual overhead costs are *not* assigned to jobs—if that could be done, the costs would be direct costs, not overhead. The overhead assigned to the job is simply a share of the total overhead that was estimated at the beginning of the year. A **normal cost system**, which we have been describing, applies overhead to jobs by multiplying a predetermined overhead rate by the actual amount of the allocation base incurred by the jobs.

Overhead may be applied as direct labor-hours are charged to jobs, or all of the overhead can be applied when the job is completed. The choice is up to the company. However, if a job is not completed at the end of the accounting period, overhead should be applied to that job so that the cost of work in process inventory can be determined.

The Need for a Predetermined Rate

Instead of using a predetermined rate based on estimates, why not base the overhead rate on the *actual* total manufacturing overhead cost and the *actual* total amount of the allocation base incurred on a monthly, quarterly, or annual basis? If an actual rate is computed monthly or quarterly, seasonal factors in overhead costs or in the allocation

EXHIBIT 2-4

A Completed Job Cost Sheet

JOB COST SHEET							
Job Number <u>2B47</u>		Date Initiated <u>March 2</u>					
		Date Completed <u>March 8</u>					
Department <u>Milling</u>							
Item <u>Special order coupling</u>		Units Completed <u>2</u>					
For Stock _____							
Direct Materials		Direct Labor			Manufacturing Overhead		
Req. No.	Amount	Ticket	Hours	Amount	Hours	Rate	Amount
14873	\$ 660	843	5	\$ 45	27	\$8/DLH	<u>\$216</u>
14875	506	846	8	60			
14912	238	850	4	21			
	<u>\$1,404</u>	851	<u>10</u>	<u>54</u>			
			<u>27</u>	<u>\$180</u>			
Cost Summary				Units Shipped			
Direct Materials	\$1,404	Date	Number	Balance			
Direct Labor	\$ 180	March 8	—	2			
Manufacturing Overhead	\$ 216						
Total Product Cost	\$1,800						
Unit Product Cost	\$ 900*						

*\$1,800 ÷ 2 units = \$900 per unit.

base can produce fluctuations in the overhead rate. For example, the costs of heating and cooling a factory in Illinois will be highest in the winter and summer months and lowest in the spring and fall. If the overhead rate is recomputed at the end of each month or each quarter based on actual costs and activity, the overhead rate would go up in the winter and summer and down in the spring and fall. As a result, two identical jobs, one completed in the winter and one completed in the spring, would be assigned different manufacturing overhead costs. Many managers believe that such fluctuations in product costs serve no useful purpose. To avoid such fluctuations, actual overhead rates could be computed on an annual or less-frequent basis. However, if the overhead rate is computed annually based on the actual costs and activity for the year, the manufacturing overhead assigned to any particular job would not be known until the end of the year. For example, the cost of Job 2B47 at Yost Precision Machining would not be known until the end of the year, even though the job will be completed and shipped to the customer in March. For these reasons, most companies use predetermined overhead rates rather than actual overhead rates in their cost accounting systems.

Choice of an Allocation Base for Overhead Cost

Ideally, the allocation base in the predetermined overhead rate should *drive* the overhead cost. A **cost driver** is a factor, such as machine-hours, beds occupied, computer time, or flight-hours, that causes overhead costs. If the base in the predetermined overhead rate does not “drive” overhead costs, product costs will be distorted. For example, if

direct labor-hours is used to allocate overhead, but in reality overhead has little to do with direct labor-hours, then products with high direct labor-hour requirements will be overcosted.

Most companies use direct labor-hours or direct labor cost as the allocation base for manufacturing overhead. However, as discussed in earlier chapters, major shifts are taking place in the structure of costs. In the past, direct labor accounted for up to 60% of the cost of many products, with overhead cost making up only a portion of the remainder. This situation has been changing for two reasons. First, sophisticated automated equipment has taken over functions that used to be performed by direct labor workers. Because the costs of acquiring and maintaining such equipment are classified as overhead, this increases overhead while decreasing direct labor. Second, products are becoming more sophisticated and complex and are changed more frequently. This increases the need for highly skilled indirect workers such as engineers. As a result of these two trends, direct labor has decreased relative to overhead as a component of product costs.

In companies where direct labor and overhead costs have been moving in opposite directions, it would be difficult to argue that direct labor “drives” overhead costs. Accordingly, managers in some companies use *activity-based costing* principles to redesign their cost accounting systems. Activity-based costing is designed to more accurately reflect the demands that products, customers, and other cost objects make on overhead resources. The activity-based approach is discussed in more detail in Chapter 3.

Although direct labor may not be an appropriate allocation base in some industries, in others it continues to be a significant driver of manufacturing overhead. Indeed, most manufacturing companies in the United States continue to use direct labor as the primary or secondary allocation base for manufacturing overhead. The key point is that the allocation base used by the company should really drive, or cause, overhead costs, and direct labor is not always the most appropriate allocation base.

Waist Management

IN BUSINESS

Research from the University of Michigan suggests that a company’s health-care costs are driven to a significant extent by the weight of its employees. Workers who are overweight can cost as much as \$1,500 more per year to insure than other workers. So what is a company to do? **Park Place Entertainment**, a casino operator with more than 7,000 employees, decided to attack the problem by holding a weight-loss contest. Over two years, the company’s workforce dropped 20 tons of weight. After the contest, 12 diabetics were able to stop using medications that cost \$13,300 per year per employee. Additionally, the company believes that its contest caused a decline in absenteeism and an increase in productivity.

Source: Jill Hecht Maxwell, “Worker Waist Management,” *Inc. magazine*, August 2004, p. 32; Jessi Hempel, “Dieting for Dollars,” *BusinessWeek*, November 3, 2003, p. 10.

The Cost of Complexity at Chrysler

IN BUSINESS

While direct labor is an important cost driver for many companies, other cost drivers can influence profitability. For example, **Chrysler’s** 2007 Dodge Nitro was available to buyers in 167,000 configurations. The costs of supporting seven exterior paint colors, two engine options, three trim levels, five feature packages, and up to 17 additional options for each of the five feature packages were exorbitant. By contrast, the **Honda CR-V**, which outsells the Nitro by a ratio of more than 2:1, comes in only 88 configurations.

Chrysler redesigned the 2008 Nitro so that it could be ordered in only 650 configurations. Similarly, it reduced the number of configurations available in the 2008 Pacifica from 35,820 to 680.



IN BUSINESS

(continued)

When asked if customers would complain about the cutbacks in available options, Chrysler's Vice President of Marketing J. Bartoli said, "If there's no one out there asking for it, have you really taken anything away?"

Source: Joann Muller, "Multiplication Problems," *Forbes*, May 21, 2007, p. 48.

Computation of Unit Costs

With the application of Yost Precision Machining's \$216 of manufacturing overhead to the job cost sheet in Exhibit 2-4, the job cost sheet is complete except for two final steps. First, the totals for direct materials, direct labor, and manufacturing overhead are transferred to the Cost Summary section of the job cost sheet and added together to obtain the total cost for the job. Then the total product cost (\$1,800) is divided by the number of units (2) to obtain the unit product cost (\$900). As indicated earlier, *this unit product cost is an average cost and should not be interpreted as the cost that would actually be incurred if another unit were produced.* The incremental cost of an additional unit is something less than the average unit cost of \$900 because much of the actual overhead costs would not change if another unit were produced.

The completed job cost sheet will serve as the basis for valuing unsold units in ending inventory and for determining cost of goods sold.

DECISION MAKER

Treasurer, Class Reunion Committee

You've agreed to handle the financial arrangements for your high school reunion. You call the restaurant where the reunion will be held and jot down the most important information. The meal cost (including beverages) will be \$30 per person plus a 15% gratuity. An additional \$200 will be charged for a banquet room with a dance floor. A band has been hired for \$500. One of the members of the reunion committee informs you that there is just enough money left in the class bank account to cover the printing and mailing costs. He mentions that at least one-half of the class of 400 will attend the reunion and wonders if he should add the 15% gratuity to the \$30 per person meal cost when he drafts the invitation, which will indicate that a check must be returned with the reply card.

How should you respond? How much will you need to charge to cover the various costs? After making your decision, label your answer with the managerial accounting terms covered in this chapter. Finally, identify any issues that should be investigated further.

MANAGERIAL ACCOUNTING IN ACTION

The Wrap-up

Summary of Document Flows

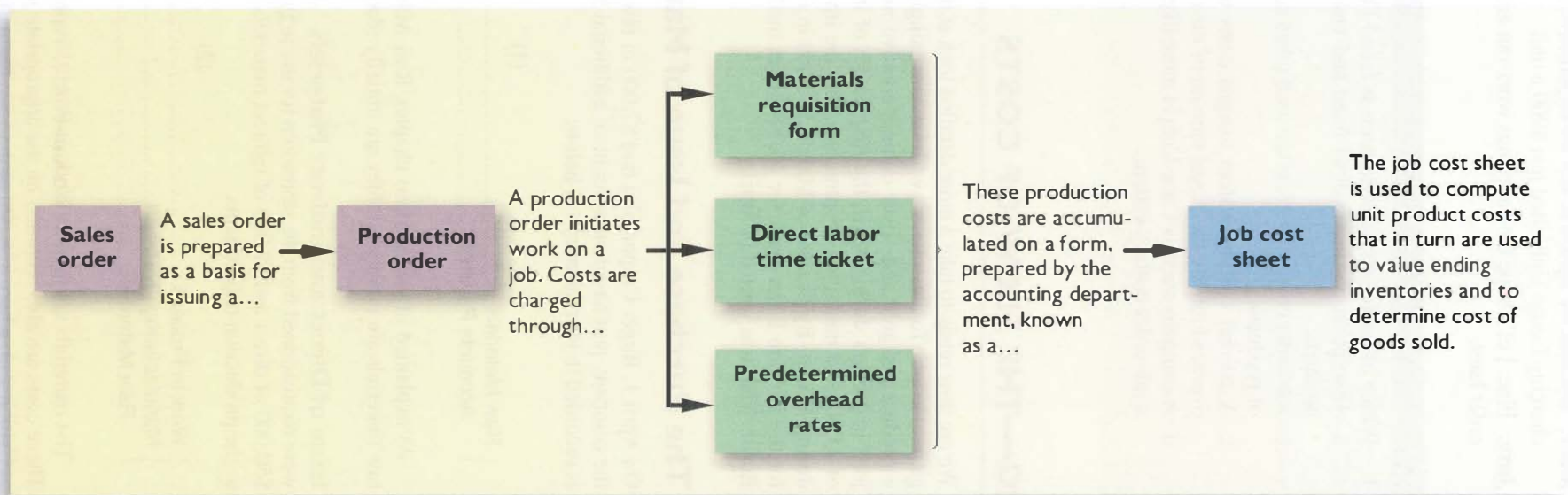
The sequence of events that we have discussed above, from receiving an order to completing a job, is summarized in Exhibit 2-5.

In the 8:00 A.M. daily planning meeting on March 9, Jean Yost, the president of Yost Precision Machining, once again drew attention to Job 2B47, the experimental couplings:

Jean: I see Job 2B47 is completed. Let's get those couplings shipped immediately to Loops Unlimited so they can get their testing program under way. Marc, how much are we going to bill Loops for those two units?



EXHIBIT 2-5 The Flow of Documents in a Job-Order Costing System



Marc: Because we agreed to sell the experimental couplings at cost, we will be charging Loops Unlimited just \$900 a unit.

Jean: Fine. Let's hope the couplings work out and we make some money on the big order later.

CONCEPT CHECK

1. Which of the following statements is false? (You may select more than one answer.)
 - a. Absorption costing assigns fixed and variable manufacturing overhead costs to products.
 - b. Job-order costing systems are used when companies produce many different types of products.
 - c. A normal costing system assigns costs to products by multiplying the actual overhead rate by the actual amount of the allocation base.
 - d. A company such as Coca-Cola is more likely to use a process costing system than a job-order costing system.

JOB-ORDER COSTING—THE FLOW OF COSTS

LEARNING OBJECTIVE 4

Understand the flow of costs in a job-order costing system and prepare appropriate journal entries to record costs.



We are now ready to take a more detailed look at the flow of costs through the company's general ledger. To illustrate, we will consider a single month's activity at Ruger Corporation, a producer of gold and silver commemorative medallions. Ruger Corporation has two jobs in process during April, the first month of its fiscal year. Job A, a special minting of 1,000 gold medallions commemorating the invention of motion pictures, was started during March. By the end of March, \$30,000 in manufacturing costs had been recorded for the job. Job B, an order for 10,000 silver medallions commemorating the fall of the Berlin Wall, was started in April.

The Purchase and Issue of Materials

On April 1, Ruger Corporation had \$7,000 in raw materials on hand. During the month, the company purchased on account an additional \$60,000 in raw materials. The purchase is recorded in journal entry (1) below:

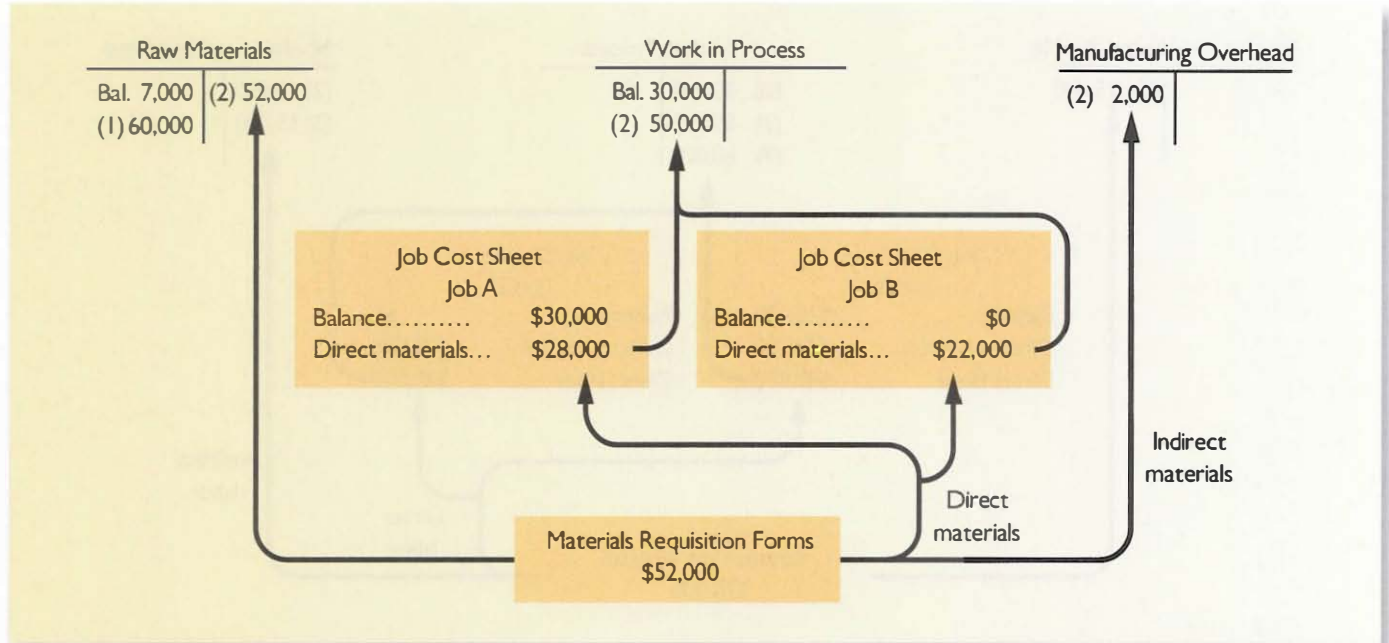
(1)		
Raw Materials	60,000	
Accounts Payable		60,000

As explained in the previous chapter, Raw Materials is an asset account. Thus, when raw materials are purchased, they are initially recorded as an asset—not as an expense.

Issue of Direct and Indirect Materials During April, \$52,000 in raw materials were requisitioned from the storeroom for use in production. These raw materials included \$50,000 of direct and \$2,000 of indirect materials. Entry (2) records issuing the materials to the production departments.

(2)		
Work in Process	50,000	
Manufacturing Overhead	2,000	
Raw Materials		52,000

The materials charged to Work in Process represent direct materials for specific jobs. These costs are also recorded on the appropriate job cost sheets. This point is illustrated in Exhibit 2–6, where \$28,000 of the \$50,000 in direct materials is charged to Job A's cost

EXHIBIT 2-6 Raw Materials Cost Flows

sheet and the remaining **\$22,000** is charged to Job B's cost sheet. (In this example, all data are presented in summary form and the job cost sheet is abbreviated.)

The **\$2,000** charged to Manufacturing Overhead in entry (2) represents indirect materials. Observe that the Manufacturing Overhead account is separate from the Work in Process account. The purpose of the Manufacturing Overhead account is to accumulate all manufacturing overhead costs as they are incurred during a period.

Before leaving Exhibit 2-6 we need to point out one additional thing. Notice from the exhibit that the job cost sheet for Job A contains a beginning balance of **\$30,000**. We stated earlier that this balance represents the cost of work done during March that has been carried forward to April. Also note that the Work in Process account contains the same **\$30,000** balance. Thus, the Work in Process account summarizes all of the costs appearing on the job cost sheets of the jobs that are in process. Job A was the only job in process at the beginning of April, so the beginning balance in the Work in Process account equals Job A's beginning balance of **\$30,000**.

Labor Cost

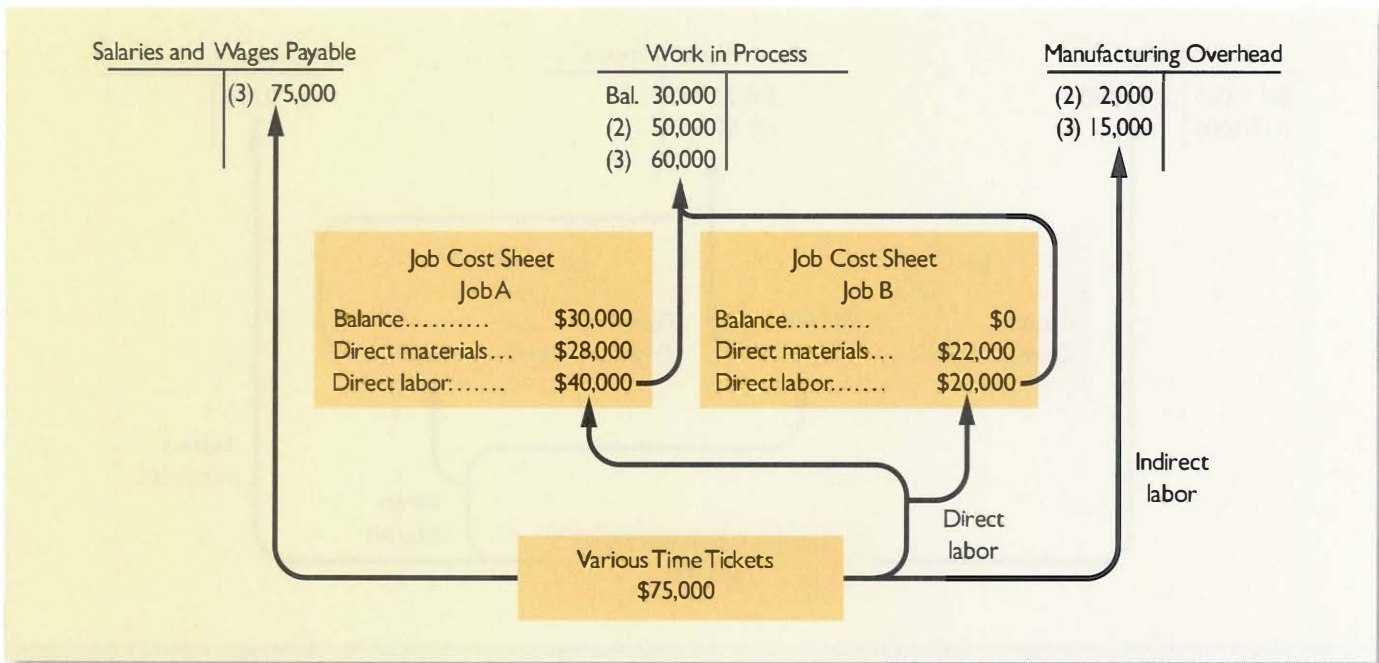
Employee time tickets are filled out by workers, collected, and forwarded to the Accounting Department. In the Accounting Department, wages are computed and the resulting costs are classified as either direct or indirect labor. In April, \$60,000 was recorded for direct labor and \$15,000 for indirect labor. The following entry summarizes those events:

(3)		
Work in Process.....	60,000	
Manufacturing Overhead.....	15,000	
Salaries and Wages Payable		75,000

Only the direct labor cost of \$60,000 is added to the Work in Process account. At the same time that direct labor costs are added to Work in Process, they are also added to the individual job cost sheets, as shown in Exhibit 2-7. During April, \$40,000 of direct labor cost was charged to Job A and the remaining \$20,000 was charged to Job B.

The labor costs charged to Manufacturing Overhead represent the indirect labor costs of the period, such as supervision, janitorial work, and maintenance.

EXHIBIT 2-7 Labor Cost Flows



Manufacturing Overhead Costs

Recall that all manufacturing costs other than direct materials and direct labor are classified as manufacturing overhead costs. These costs are entered directly into the Manufacturing Overhead account as they are incurred. To illustrate, assume that Ruger Corporation incurred the following general factory costs during April:

Utilities (heat, water, and power)	\$21,000
Rent on factory equipment	16,000
Miscellaneous factory overhead costs	3,000
Total	\$40,000

The following entry records the incurrence of these costs:

(4)	
Manufacturing Overhead	40,000
Accounts Payable*	40,000

*Accounts such as Cash may also be credited

In addition, assume that during April, Ruger Corporation recognized \$13,000 in accrued property taxes and that \$7,000 in prepaid insurance expired on factory buildings and equipment. The following entry records these items:

(5)	
Manufacturing Overhead	20,000
Property Taxes Payable	13,000
Prepaid Insurance	7,000

Finally, assume that the company recognized \$18,000 in depreciation on factory equipment during April. The following entry records the accrual of this depreciation:

	(6)		
Manufacturing Overhead		18,000	
Accumulated Depreciation			18,000

In short, manufacturing overhead costs are recorded directly into the Manufacturing Overhead account as they are incurred.

Applying Manufacturing Overhead

Because actual manufacturing costs are charged to the Manufacturing Overhead control account rather than to Work in Process, how are manufacturing overhead costs assigned to Work in Process? The answer is, by means of the predetermined overhead rate. Recall from our discussion earlier in the chapter that a predetermined overhead rate is established at the beginning of each year. The rate is calculated by dividing the estimated total manufacturing overhead cost for the year by the estimated total amount of the allocation base (measured in machine-hours, direct labor-hours, or some other base). The predetermined overhead rate is then used to apply overhead costs to jobs. For example, if machine-hours is the allocation base, overhead cost is applied to each job by multiplying the predetermined overhead rate by the number of machine-hours charged to the job.

To illustrate, assume that **Ruger Corporation**'s predetermined overhead rate is \$6 per machine-hour. Also assume that during April, 10,000 machine-hours were worked on Job A and 5,000 machine-hours were worked on Job B (a total of 15,000 machine-hours). Thus, \$90,000 in overhead cost (\$6 per machine-hour × 15,000 machine-hours = \$90,000) would be applied to Work in Process. The following entry records the application of Manufacturing Overhead to Work in Process:

	(7)		
Work in Process		90,000	
Manufacturing Overhead			90,000

The flow of costs through the Manufacturing Overhead account is shown in Exhibit 2–8.

LEARNING OBJECTIVE 5
Apply overhead cost to Work in Process using a predetermined overhead rate.

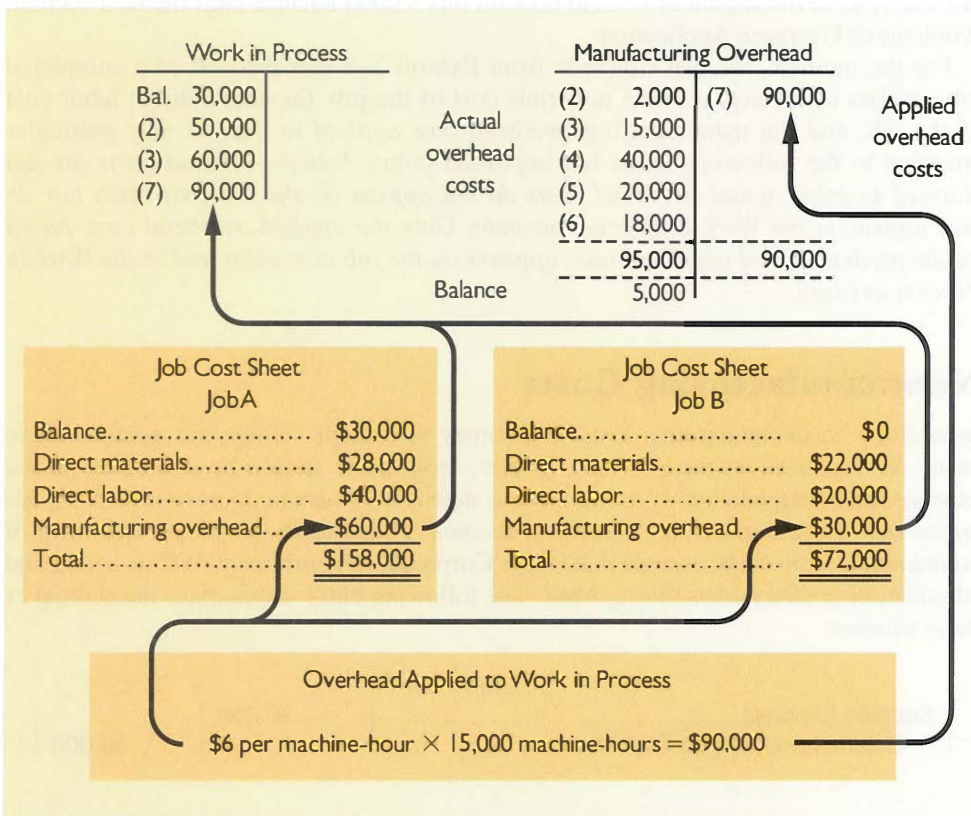
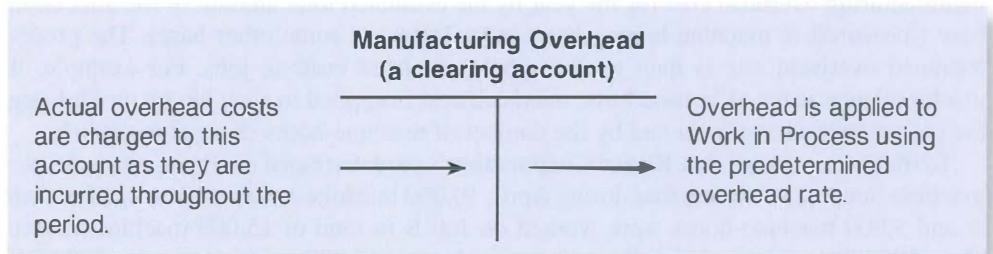


EXHIBIT 2-8
The Flow of Costs in Overhead Application

The actual overhead costs on the debit side in the Manufacturing Overhead account in Exhibit 2–8 are the costs that were added to the account in entries (2)–(6). Observe that recording these actual overhead costs [entries (2)–(6)] and the application of overhead to Work in Process [entry (7)] represent two separate and entirely distinct processes.

The Concept of a Clearing Account The Manufacturing Overhead account operates as a clearing account. As we have noted, actual factory overhead costs are debited to the account as they are incurred throughout the year. When a job is completed (or at the end of an accounting period), overhead cost is applied to the job using the predetermined overhead rate, and Work in Process is debited and Manufacturing Overhead is credited. This sequence of events is illustrated below:



As we emphasized earlier, the predetermined overhead rate is based entirely on estimates of what the level of activity and overhead costs are *expected* to be, and it is established before the year begins. As a result, the overhead cost applied during a year will almost certainly turn out to be more or less than the actual overhead cost incurred. For example, notice from Exhibit 2–8 that Ruger Corporation’s actual overhead costs for the period are \$5,000 greater than the overhead cost that has been applied to Work in Process, resulting in a \$5,000 debit balance in the Manufacturing Overhead account. We will reserve discussion of what to do with this \$5,000 balance until the next section, Problems of Overhead Application.

For the moment, we can conclude from Exhibit 2–8 that the cost of a completed job consists of the actual direct materials cost of the job, the actual direct labor cost of the job, and the manufacturing overhead cost *applied* to the job. Pay particular attention to the following subtle but important point: *Actual overhead costs are not charged to jobs; actual overhead costs do not appear on the job cost sheet nor do they appear in the Work in Process account. Only the applied overhead cost, based on the predetermined overhead rate, appears on the job cost sheet and in the Work in Process account.*

Nonmanufacturing Costs

In addition to manufacturing costs, companies also incur selling and administrative costs. As explained in the previous chapter, these costs should be treated as period expenses and charged directly to the income statement. *Nonmanufacturing costs should not go into the Manufacturing Overhead account.* To illustrate the correct treatment of nonmanufacturing costs, assume that Ruger Corporation incurred \$30,000 in selling and administrative salary costs during April. The following entry summarizes the accrual of those salaries:

	(8)		
Salaries Expense		30,000	30,000
Salaries and Wages Payable			

Assume that depreciation on office equipment during April was \$7,000. The entry is as follows:

(9)		
Depreciation Expense	7,000	
Accumulated Depreciation		7,000

Pay particular attention to the difference between this entry and entry (6) where we recorded depreciation on factory equipment. In journal entry (6), depreciation on factory equipment was debited to Manufacturing Overhead and is therefore a product cost. In journal entry (9) above, depreciation on office equipment is debited to Depreciation Expense. Depreciation on office equipment is a period expense rather than a product cost.

Finally, assume that advertising was \$42,000 and that other selling and administrative expenses in April totaled \$8,000. The following entry records these items:

(10)		
Advertising Expense	42,000	
Other Selling and Administrative Expense	8,000	
Accounts Payable*		50,000

*Other accounts, such as Cash may be credited.

The amounts in entries (8) through (10) all go directly into expense accounts—they have no effect on product costs. The same will be true of any other selling and administrative expenses incurred during April, including sales commissions, depreciation on sales equipment, rent on office facilities, insurance on office facilities, and related costs.

Cost of Goods Manufactured

When a job has been completed, the finished output is transferred from the production departments to the finished goods warehouse. By this time, the accounting department will have charged the job with direct materials and direct labor cost, and manufacturing overhead will have been applied using the predetermined overhead rate. A transfer of costs is made within the costing system that *parallels* the physical transfer of goods to the finished goods warehouse. The costs of the completed job are transferred out of the Work in Process account and into the Finished Goods account. The sum of all amounts transferred between these two accounts represents the cost of goods manufactured for the period.

In the case of Ruger Corporation, assume that Job A was completed during April. The following entry transfers the cost of Job A from Work in Process to Finished Goods:

(11)		
Finished Goods	158,000	
Work in Process		158,000

The \$158,000 represents the completed cost of Job A, as shown on the job cost sheet in Exhibit 2–8. Because Job A was the only job completed during April, the \$158,000 also represents the cost of goods manufactured for the month.

Job B was not completed by the end of the month, so its cost will remain in the Work in Process account and carry over to the next month. If a balance sheet is prepared at the end of April, the cost accumulated thus far on Job B will appear as the asset “Work in Process inventory.”

LEARNING OBJECTIVE 6

Prepare schedules of cost of goods manufactured and cost of goods sold.



Cost of Goods Sold

As finished goods are shipped to customers, their accumulated costs are transferred from the Finished Goods account to the Cost of Goods Sold account. If an entire job is shipped at one time, then the entire cost appearing on the job cost sheet is transferred to the Cost of Goods Sold account. In most cases, however, only a portion of the units involved in a particular job will be immediately sold. In these situations, the unit product cost must be used to determine how much product cost should be removed from Finished Goods and charged to Cost of Goods Sold.

For Ruger Corporation, we will assume 750 of the 1,000 gold medallions in Job A were shipped to customers by the end of the month for total sales revenue of \$225,000. Because 1,000 units were produced and the total cost of the job from the job cost sheet was \$158,000, the unit product cost was \$158. The following journal entries would record the sale (all sales were on account):

	(12)			
Accounts Receivable		225,000		
Sales			225,000	
	(13)			
Cost of Goods Sold.....		118,500		
Finished Goods			118,500	
(750 units × \$158 per unit = \$118,500)				

Entry (13) completes the flow of costs through the job-order costing system.

Summary of Cost Flows

LEARNING OBJECTIVE 7

Use T-accounts to show the flow of costs in a job-order costing system.



To pull the entire Ruger Corporation example together, journal entries (1) through (13) are summarized in Exhibit 2-9. The flow of costs through the accounts is presented in T-account form in Exhibit 2-10.

Exhibit 2-11 presents a schedule of cost of goods manufactured and a schedule of cost of goods sold for Ruger Corporation. Note particularly from Exhibit 2-11 that the manufacturing overhead cost on the schedule of cost of goods manufactured is the overhead applied to jobs during the month—not the actual manufacturing overhead costs incurred. The reason for this can be traced back to journal entry (7) and the T-account for Work in Process that appears in Exhibit 2-10. Under a normal costing system as illustrated in this chapter, applied—not actual—overhead costs are applied to jobs and thus to Work in Process inventory.

Note also, as shown in Exhibit 2-11, that the cost of goods manufactured for the month (\$158,000) agrees with the amount transferred from Work in Process to Finished Goods for the month as recorded earlier in entry (11). Also note that this \$158,000 is used in computing the cost of goods sold for the month.

If you carefully compare the Schedule of Cost of Goods Manufactured in Exhibit 2-11 to the Schedule of Cost of Goods Manufactured in Chapter 1, you will see two differences. First, when the direct materials cost is computed in Exhibit 2-11, the cost of the indirect materials included in manufacturing overhead is deducted from the raw materials used in production. This was not done in Chapter 1 because the examples we used did not involve any indirect materials. Second, you may have noticed that the term “Manufacturing overhead applied to work in process” is used in the schedule in this chapter whereas the simpler term “Manufacturing overhead” was used in Chapter 1. We did not want to get into the complications involved in applying overhead in the last chapter, so we used the simpler term without specifying where the manufacturing overhead cost comes from. In this chapter, we have learned that the manufacturing overhead cost is applied to jobs

EXHIBIT 2-9
Summary of Ruger Corporation
Journal Entries

(1)			
Raw Materials	60,000		
Accounts Payable		60,000	
(2)			
Work in Process	50,000		
Manufacturing Overhead	2,000		
Raw Materials		52,000	
(3)			
Work in Process	60,000		
Manufacturing Overhead	15,000		
Salaries and Wages Payable		75,000	
(4)			
Manufacturing Overhead	40,000		
Accounts Payable		40,000	
(5)			
Manufacturing Overhead	20,000		
Property Taxes Payable		13,000	
Prepaid Insurance		7,000	
(6)			
Manufacturing Overhead	18,000		
Accumulated Depreciation		18,000	
(7)			
Work in Process	90,000		
Manufacturing Overhead		90,000	
(8)			
Salaries Expense	30,000		
Salaries and Wages Payable		30,000	
(9)			
Depreciation Expense	7,000		
Accumulated Depreciation		7,000	
(10)			
Advertising Expense	42,000		
Other Selling and Administrative Expense	8,000		
Accounts Payable		50,000	
(11)			
Finished Goods	158,000		
Work in Process		158,000	
(12)			
Accounts Receivable	225,000		
Sales		225,000	
(13)			
Cost of Goods Sold	118,500		
Finished Goods		118,500	

EXHIBIT 2-10 Summary of Cost Flows—Ruger Corporation

Accounts Receivable		Accounts Payable		Capital Stock	
Bal.	XX	Bal.	XX	Bal.	XX
(12)	225,000	(1)	60,000		
		(4)	40,000		
		(10)	50,000		
Prepaid Insurance		Salaries and Wages Payable		Retained Earnings	
Bal.	XX			Bal.	XX
(5)	7,000				
Raw Materials		Property Taxes Payable		Sales	
Bal.	7,000	Bal.	XX		
(1)	60,000	(3)	75,000	(12)	225,000
		(8)	30,000		
(2)	52,000				
Bal.	15,000				
Work in Process				Cost of Goods Sold	
Bal.	30,000	Bal.	XX	(13)	118,500
(2)	50,000	(5)	13,000		
(3)	60,000				
(7)	90,000				
Bal.	72,000				
Finished Goods				Salaries Expense	
Bal.	10,000			(8)	30,000
(11)	158,000				
Bal.	49,500				
Accumulated Depreciation				Depreciation Expense	
				(9)	7,000
		Bal.	XX		
		(6)	18,000		
		(9)	7,000		
Manufacturing Overhead				Advertising Expense	
(2)	2,000			(10)	42,000
(3)	15,000				
(4)	40,000				
(5)	20,000				
(6)	18,000				
	95,000	(7)	90,000		
Bal.	5,000				

Explanation of entries:

- | | |
|---|---|
| (1) Raw materials purchased. | (8) Administrative salaries expense incurred. |
| (2) Direct and indirect materials issued into production. | (9) Depreciation recorded on office equipment. |
| (3) Direct and indirect factory labor cost incurred. | (10) Advertising and other selling and administrative expense incurred. |
| (4) Utilities and other factory costs incurred. | (11) Cost of goods manufactured transferred to finished goods. |
| (5) Property taxes and insurance incurred on the factory. | (12) Sale of Job A recorded. |
| (6) Depreciation recorded on factory assets. | (13) Cost of goods sold recorded for Job A. |
| (7) Overhead cost applied to Work in Process. | |

Cost of Goods Manufactured

Direct materials:		
Raw materials inventory, beginning.....	\$ 7,000	
Add: Purchases of raw materials.....	60,000	
Total raw materials available.....	67,000	
Deduct: Raw materials inventory, ending.....	15,000	
Raw materials used in production.....	52,000	
Deduct: Indirect materials included in manufacturing overhead.....	2,000	\$ 50,000
Direct labor.....		60,000
Manufacturing overhead applied to work in process.....		90,000
Total manufacturing costs.....		200,000
Add: Beginning work in process inventory.....		30,000
		230,000
Deduct: Ending work in process inventory.....		72,000
Cost of goods manufactured.....		<u>\$158,000</u>
Cost of Goods Sold		
Finished goods inventory, beginning.....	\$ 10,000	
Add: Cost of goods manufactured.....	158,000	
Goods available for sale.....		168,000
Deduct: Finished goods inventory, ending.....		49,500
Unadjusted cost of goods sold.....		118,500
Add: Underapplied overhead.....		5,000
Adjusted cost of goods sold.....		<u>\$123,500</u>

EXHIBIT 2-11
Schedules of Cost of Goods Manufactured and Cost of Goods Sold

*Note that the underapplied overhead is added to cost of goods sold. If overhead were overapplied, it would be deducted from cost of goods sold.

**Ruger Corporation
Income Statement
For the Month Ending April 30**

Sales.....		\$225,000
Cost of goods sold (\$118,500 + \$5,000).....		<u>123,500</u>
Gross margin.....		101,500
Selling and administrative expenses:		
Salaries expense.....	\$30,000	
Depreciation expense.....	7,000	
Advertising expense.....	42,000	
Other expense.....	8,000	87,000
Net operating income.....		<u>\$ 14,500</u>

EXHIBIT 2-12
Income Statement

by multiplying the predetermined overhead rate by the amount of the allocation base recorded for the jobs.

If you carefully compare the Schedule of Cost of Goods Sold in Exhibit 2-11 to the Income Statement for Graham Manufacturing in Chapter 1, you will also note that there is a difference in the way the cost of goods sold is computed. In Exhibit 2-11, something called “Underapplied overhead” is added to the unadjusted cost of goods sold to arrive at the adjusted cost of goods sold. In the next section we will discuss what this means.

Finally, an income statement for April is presented in Exhibit 2-12. Observe that the cost of goods sold on this statement (\$123,500) is carried over from Exhibit 2-11.

PROBLEMS OF OVERHEAD APPLICATION

We need to consider two complications relating to overhead application: (1) underapplied and overapplied overhead; and (2) the disposition of any balance remaining in the Manufacturing Overhead account at the end of a period.

LEARNING OBJECTIVE 8

Compute underapplied or overapplied overhead cost and prepare the journal entry to close the balance in Manufacturing Overhead to the appropriate accounts.



Underapplied and Overapplied Overhead

Because the predetermined overhead rate is established before the period begins and is based entirely on estimated data, the overhead cost applied to Work in Process will generally differ from the amount of overhead cost actually incurred. In the case of Ruger Corporation, for example, the predetermined overhead rate of \$6 per hour was used to apply \$90,000 of overhead cost to Work in Process, whereas actual overhead costs for April proved to be \$95,000 (see Exhibit 2–8). The difference between the overhead cost applied to Work in Process and the actual overhead costs of a period is called either **underapplied** or **overapplied overhead**. For Ruger Corporation, overhead was underapplied by \$5,000 because the applied cost (\$90,000) was \$5,000 less than the actual cost (\$95,000). If the situation had been reversed and the company had applied \$95,000 in overhead cost to Work in Process while incurring actual overhead costs of only \$90,000, then the overhead would have been overapplied.

What is the cause of underapplied or overapplied overhead? The causes can be complex, and a full explanation will have to wait for later chapters. Nevertheless, the basic problem is that the method of applying overhead to jobs using a predetermined overhead rate assumes that actual overhead costs will be proportional to the actual amount of the allocation base incurred during the period. If, for example, the predetermined overhead rate is \$6 per machine-hour, then it is assumed that actual overhead costs incurred will be \$6 for every machine-hour that is actually worked. There are at least two reasons why this may not be true. First, much of the overhead often consists of fixed costs that do not change as the number of machine-hours incurred goes up or down. Second, spending on overhead items may or may not be under control. If individuals who are responsible for overhead costs do a good job, those costs should be less than were expected at the beginning of the period. If they do a poor job, those costs will be more than expected. Nevertheless, as we indicated above a fuller explanation of the causes of underapplied and overapplied overhead will have to wait for later chapters.

To illustrate what can happen, suppose that two companies—Turbo Crafters and Black & Howell—have prepared the following estimated data for the coming year:

	Turbo Crafters	Black & Howell
Allocation base.....	Machine-hours	Direct materials cost
Estimated manufacturing overhead cost (a)	\$300,000	\$120,000
Estimated total amount of the allocation base (b).....	75,000 machine-hours	\$80,000 direct materials cost
Predetermined overhead rate (a) ÷ (b).....	\$4 per machine-hour	150% of direct materials cost

Note that when the allocation base is dollars (such as direct materials cost in the case of Black & Howell) the predetermined overhead rate is expressed as a percentage of the allocation base. When dollars are divided by dollars, the result is a percentage.

Now assume that because of unexpected changes in overhead spending and in demand for the companies' products, the *actual* overhead cost and the actual activity recorded during the year in each company are as follows:

	Turbo Crafters	Black & Howell
Actual manufacturing overhead cost	\$290,000	\$130,000
Actual total amount of the allocation base	68,000 machine-hours	\$90,000 direct materials cost

For each company, note that the actual data for both cost and the allocation base differ from the estimates used in computing the predetermined overhead rate. This results in underapplied and overapplied overhead as follows:

	Turbo Crafters	Black & Howell
Actual manufacturing overhead cost	\$290,000	\$ 130,000
Manufacturing overhead cost applied to Work in Process during the year:		
Predetermined overhead rate (a)	\$4 per machine-hour	150% of direct materials cost
Actual total amount of the allocation base (b)	68,000 machine-hours	\$ 90,000 direct materials cost
Manufacturing overhead applied (a) × (b)	\$272,000	\$ 135,000
Underapplied (overapplied) manufacturing overhead	\$ 18,000	\$ (5,000)

For Turbo Crafters, the amount of overhead cost applied to Work in Process (\$272,000) is less than the actual overhead cost for the year (\$290,000). Therefore, overhead is underapplied.

For Black & Howell, the amount of overhead cost applied to Work in Process (\$135,000) is greater than the actual overhead cost for the year (\$130,000), so overhead is overapplied.

A summary of these concepts is presented in Exhibit 2–13.

Disposition of Underapplied or Overapplied Overhead Balances

If you look at the Manufacturing Overhead T-account in Exhibit 2–10, you will see that there is a debit balance of \$5,000. Remember that debit entries to the account represent actual overhead costs incurred, whereas credit entries represent overhead costs applied to jobs. In this case, the actual overhead costs incurred exceeded the overhead costs applied to jobs by \$5,000—hence the debit balance of \$5,000. This may sound familiar. We just discussed in the previous section the fact that the overhead costs incurred (\$95,000) exceeded

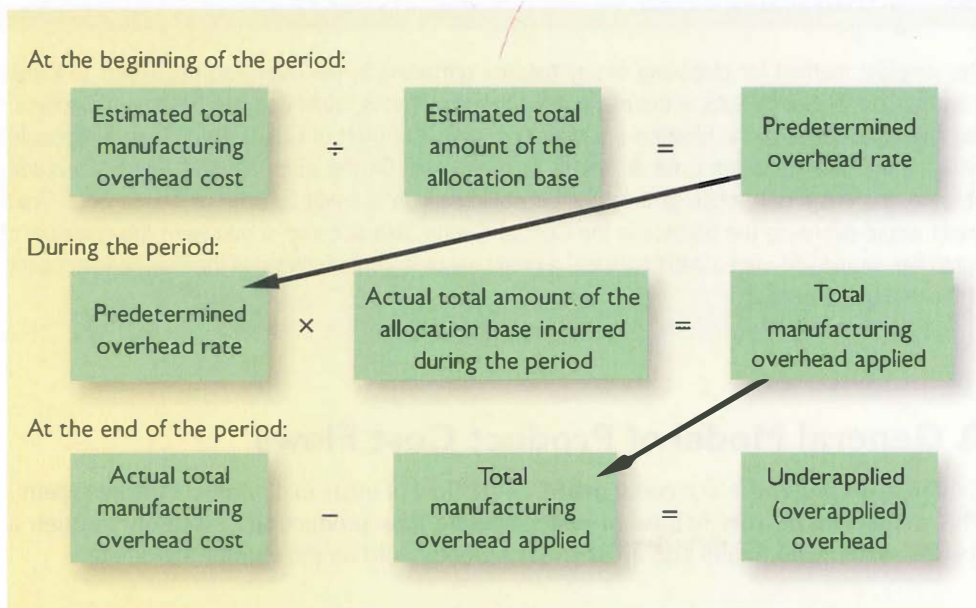


EXHIBIT 2-13
Summary of Overhead Concepts

the overhead costs applied (\$90,000), and that the difference is called underapplied overhead. These are just two ways of looking at the same thing. If there is a *debit* balance in the Manufacturing Overhead account of X dollars, then the overhead is *underapplied* by X dollars. On the other hand, if there is a *credit* balance in the Manufacturing Overhead account of Y dollars, then the overhead is *overapplied* by Y dollars. What happens to any underapplied or overapplied balance remaining in the Manufacturing Overhead account at the end of a period? The simplest method is to close out the balance to Cost of Goods Sold. More complicated methods are sometimes used, but they are beyond the scope of this book. To illustrate the simplest method, recall that Ruger Corporation had underapplied overhead of \$5,000. The entry to close this underapplied overhead to Cost of Goods Sold would be:

	(14)			
Cost of Goods Sold		5,000		
Manufacturing Overhead			5,000	

Note that because the Manufacturing Overhead account has a debit balance, Manufacturing Overhead must be credited to close out the account. This has the effect of increasing Cost of Goods Sold for April to \$123,500:

Unadjusted cost of goods sold [from entry (13)]	\$118,500
Add underapplied overhead [entry (14) above].....	5,000
Adjusted cost of goods sold	\$123,500

After this adjustment has been made, Ruger Corporation's income statement for April will appear as shown earlier in Exhibit 2–12.

Note that this adjustment makes sense. The unadjusted cost of goods sold is based on the amount of manufacturing overhead applied to jobs, not the manufacturing overhead costs actually incurred. Because overhead was underapplied, not enough cost was applied to jobs. Hence, the cost of goods sold was understated. Adding the underapplied overhead to the cost of goods sold corrects this understatement.

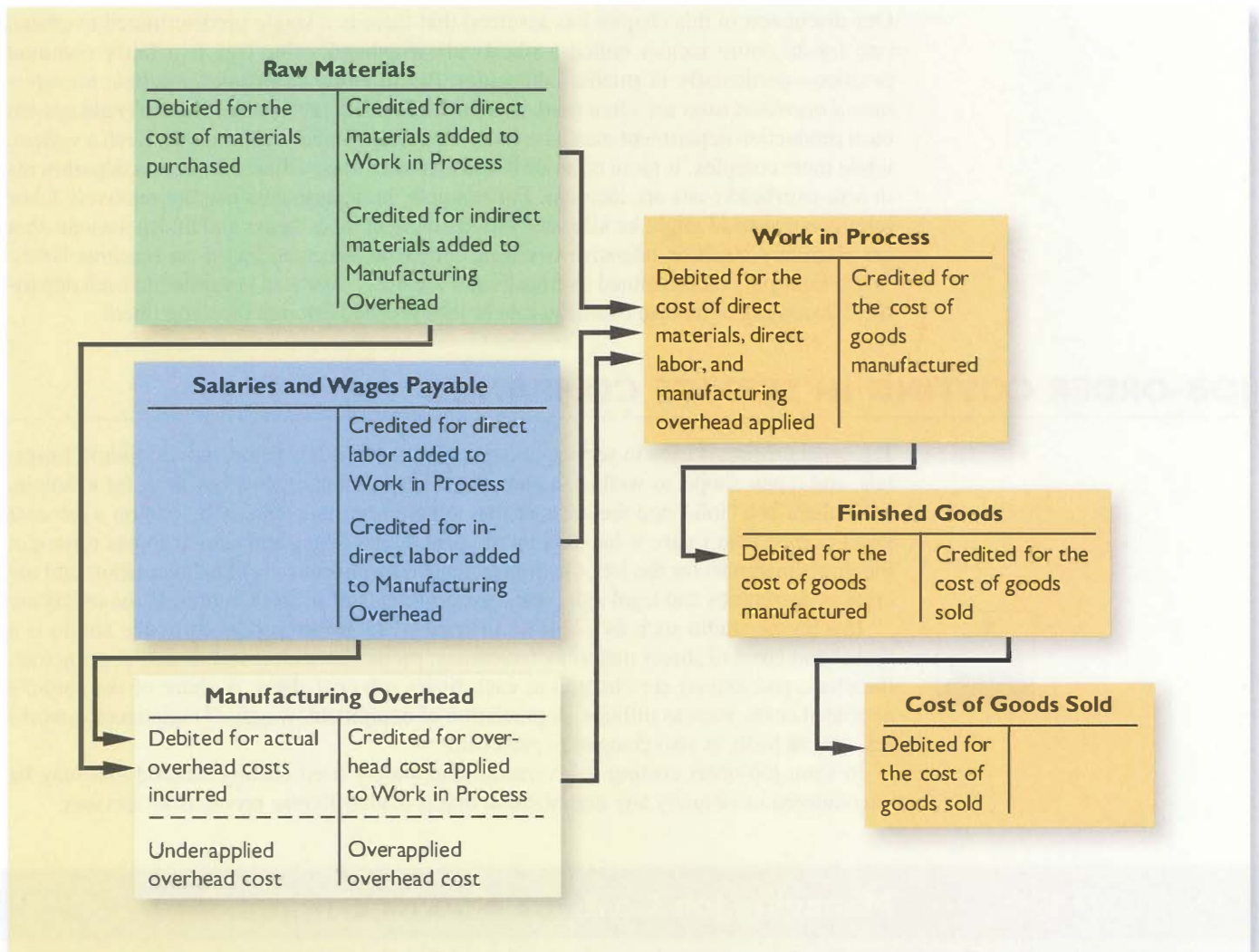
YOU DECIDE

Remaining Balance in the Overhead Account

The simplest method for disposing of any balance remaining in the Overhead account is to close it out to Cost of Goods Sold. If there is a debit balance (that is, overhead has been underapplied), the entry to dispose of the balance would include a debit to Cost of Goods Sold. That debit would increase the balance in the Cost of Goods Sold account. On the other hand, if there is a credit balance, the entry to dispose of the balance would include a credit to Cost of Goods Sold. That credit would decrease the balance in the Cost of Goods Sold account. If you were the company's controller, would you want a debit balance, a credit balance, or no balance in the Overhead account at the end of the period?

A General Model of Product Cost Flows

Exhibit 2–14 presents a T-account model of the flow of costs in a product costing system. This model can be very helpful in understanding how production costs flow through a costing system and finally end up as Cost of Goods Sold on the income statement.

EXHIBIT 2-14 A General Model of Cost Flows

2. Which of the following statements is true? (You may select more than one answer.)
 - a. The Manufacturing Overhead account is debited when manufacturing overhead is applied to Work in Process.
 - b. Job cost sheets accumulate the actual overhead costs incurred to complete a job.
 - c. When products are transferred from work in process to finished goods it results in a debit to Finished Goods and a credit to Work in Process.
 - d. Selling expenses are applied to production using a predetermined overhead rate that is computed at the beginning of the period.
3. The predetermined overhead rate is \$50 per machine hour, underapplied overhead is \$5,000, and the actual amount of machine hours is 2,000. What is the actual amount of total manufacturing overhead incurred during the period?
 - a. \$105,000
 - b. \$95,000
 - c. \$150,000
 - d. \$110,000

 **CONCEPT CHECK**

Multiple Predetermined Overhead Rates

Our discussion in this chapter has assumed that there is a single predetermined overhead rate for an entire factory called a **plantwide overhead rate**. This is a fairly common practice—particularly in smaller companies. But in larger companies, *multiple predetermined overhead rates* are often used. In a **multiple predetermined overhead rate** system each production department may have its own predetermined overhead rate. Such a system, while more complex, is more accurate because it can reflect differences across departments in how overhead costs are incurred. For example, in departments that are relatively labor intensive overhead might be allocated based on direct labor-hours and in departments that are relatively machine intensive overhead might be allocated based on machine-hours. When multiple predetermined overhead rates are used, overhead is applied in each department according to its own overhead rate as jobs proceed through the department.

JOB-ORDER COSTING IN SERVICE COMPANIES

Job-order costing is used in service organizations such as law firms, movie studios, hospitals, and repair shops, as well as in manufacturing companies. In a law firm, for example, each client is a “job,” and the costs of that job are accumulated day by day on a job cost sheet as the client’s case is handled by the firm. Legal forms and similar inputs represent the direct materials for the job; the time expended by attorneys is like direct labor; and the costs of secretaries and legal aids, rent, depreciation, and so forth, represent the overhead.



In a movie studio such as **Columbia Pictures**, each film produced by the studio is a “job,” and costs of direct materials (costumes, props, film, etc.) and direct labor (actors, directors, and extras) are charged to each film’s job cost sheet. A share of the studio’s overhead costs, such as utilities, depreciation of equipment, wages of maintenance workers, and so forth, is also charged to each film.

In sum, job-order costing is a versatile and widely used costing method that may be encountered in virtually any organization that provides diverse products or services.

IN BUSINESS

Managing Job Costs in a Service Business

IBM has created a software program called Professional Marketplace to match IBM employees with client needs. “Using Marketplace, IBM consultants working for customers can search through 100 job classifications and 10,000 skills, figuring out who inside IBM is available, where they are located and roughly how much it costs the company to use them.” Thus far, the results have been encouraging. IBM has reduced its reliance on outside contractors by 5% to 7% and its consultants spend more of their time in billable work. Furthermore, IBM’s senior consultants can search across the globe for available employees with particular niche skills with the click of a mouse instead of having to rely on numerous time-consuming phone calls and emails.

Source: Charles Forelle, “IBM Tool Deploys Employees Efficiently,” *The Wall Street Journal*, July 14, 2005, p. B3.

SUMMARY

LO1 Distinguish between process costing and job-order costing and identify companies that would use each costing method.

Job-order costing and process costing are widely used to track costs. Job-order costing is used in situations where the organization offers many different products or services, such as in furniture manufacturing, hospitals, and law firms. Process costing is used where units of product are homogeneous, such as in flour milling or cement production.

LO2 Identify the documents used in a job-order costing system.

In a job-order costing system, each job has its own job cost sheet. Materials requisition forms and labor time tickets are used to record direct materials and direct labor costs. These costs, together with manufacturing overhead, are accumulated on job cost sheets.

LO3 Compute predetermined overhead rates and explain why estimated overhead costs (rather than actual overhead costs) are used in the costing process.

Manufacturing overhead costs are assigned to jobs using a predetermined overhead rate. The rate is determined at the beginning of the period so that jobs can be costed throughout the period rather than waiting until the end of the period. The predetermined overhead rate is determined by dividing the estimated total manufacturing overhead cost for the period by the estimated total amount of the allocation base for the period.

LO4 Understand the flow of costs in a job-order costing system and prepare appropriate journal entries to record costs.

Direct materials costs are debited to Work in Process when they are released for use in production. Direct labor costs are debited to Work in Process as incurred. Actual manufacturing overhead costs are debited to the Manufacturing Overhead control account as incurred. Manufacturing overhead costs are applied to Work in Process using the predetermined overhead rate. The journal entry that accomplishes this is a debit to Work in Process and a credit to the Manufacturing Overhead control account.

LO5 Apply overhead cost to Work in Process using a predetermined overhead rate.

Overhead is applied to jobs by multiplying the predetermined overhead rate by the actual amount of the allocation base used by the job.

LO6 Prepare schedules of cost of goods manufactured and cost of goods sold.

See Exhibit 2-11 for an example of these schedules.

LO7 Use T-accounts to show the flow of costs in a job-order costing system.

See Exhibit 2-14 for a summary of the cost flows through the T-accounts.

LO8 Compute underapplied or overapplied overhead cost and prepare the journal entry to close the balance in Manufacturing Overhead to the appropriate accounts.

The difference between the actual overhead cost incurred during a period and the amount of overhead cost applied to production is referred to as underapplied or overapplied overhead. Underapplied or overapplied overhead is closed out to Cost of Goods Sold. When overhead is underapplied, the balance in the Manufacturing Overhead control account is debited to Cost of Goods Sold. This has the effect of increasing the Cost of Goods Sold and occurs because costs assigned to products have been understated. When overhead is overapplied, the balance in the Manufacturing Overhead control account is credited to Cost of Goods Sold. This has the effect of decreasing the Cost of Goods Sold and occurs because costs assigned to products have been overstated.

GUIDANCE ANSWERS TO DECISION MAKER AND YOU DECIDE

Treasurer, Class Reunion Committee (p.86)

You should charge \$38.00 per person to cover the costs calculated as follows:

Meal cost	\$30.00	Direct material cost
Gratuity ($\$30 \times 0.15$).....	4.50	Direct labor cost
Room charge ($\$200 \div 200$ expected attendees).....	1.00	Overhead cost
Band cost ($\$500 \div 200$ expected attendees).....	2.50	Overhead cost
Total cost.....	\$38.00	

If exactly 200 classmates attend the reunion, the \$7,600 of receipts (200 @ \$38) will cover the expenditures of \$7,600 [meal cost of \$6,000 (or 200 @ \$30) plus gratuity cost of \$900 (or \$6,000 × 0.15) plus the \$200 room charge plus the \$500 band cost]. Unfortunately, if less than 200 attend, the Reunion Committee will come up short in an amount equal to the difference between the 200 estimated attendees and the actual number of attendees times \$3.50 (the total per person overhead charge). As such, you should talk to the members of the Reunion Committee to ensure that (1) the estimate is as reasonable as possible, and (2) there is a plan to deal with any shortage. On the other hand, if more than 200 attend, the Reunion Committee will collect more money than it needs to disburse. The amount would be equal to the difference between the actual number of attendees and the 200 estimated attendees times \$3.50.

Remaining Balance in the Overhead Account (p. 100)

A quick response on your part might have been that you would prefer a credit balance in the Overhead account. The entry to dispose of the balance would decrease the balance in the Cost of Goods Sold account and would cause the company's gross margin and net operating income to be higher than might have otherwise been expected. However, the impact on decision making during the period should be carefully considered.

Ideally, a controller would want the balance in the Overhead account to be zero. If there is no remaining balance in the Overhead account at the end of the period, that means that the actual overhead costs for the period (which are debited to the Overhead account) exactly equaled the overhead costs that were applied (or allocated to the products made by being added to the Work in Process account) during the period. As a result, the products made during the period would have had the "correct" amount of overhead assigned as they moved from the factory floor to the finished goods area to the customer. Typically, this would not be the case because the predetermined overhead rate (used to apply or allocate overhead to the products made) is developed using two estimates (the total amount of overhead expected and the total amount of the allocation base expected during the period). It would be difficult, if not impossible, to accurately predict one or both estimates.

If there is a remaining balance in the Overhead account, then the products manufactured during the period either received too little overhead (if there is a debit or underapplied balance) or too much overhead (if there is a credit or overapplied balance).



GUIDANCE ANSWERS TO CONCEPT CHECKS

- Choice c.** A predetermined overhead rate rather than an actual overhead rate is used in a normal costing system.
- Choice c.** The Manufacturing Overhead account is credited when manufacturing overhead is applied to Work in Process. Job cost sheets do not accumulate actual overhead costs. They accumulate the amount of the overhead that has been applied to the job using the predetermined overhead rate. Selling expenses are period costs. They are not applied to production.
- Choice a.** The amount of overhead applied to production is 2,000 hours multiplied by the \$50 predetermined rate, or \$100,000. If overhead is underapplied by \$5,000, the actual amount of overhead is \$100,000 + \$5,000, or \$105,000.

REVIEW PROBLEM: JOB-ORDER COSTING

Hogle Corporation is a manufacturer that uses job-order costing. On January 1, the beginning of its fiscal year, the company's inventory balances were as follows:

Raw materials	\$20,000
Work in process	\$15,000
Finished goods.....	\$30,000

The company applies overhead cost to jobs on the basis of machine-hours worked. For the current year, the company estimated that it would work 75,000 machine-hours and incur \$450,000 in manufacturing overhead cost. The following transactions were recorded for the year:

- Raw materials were purchased on account, \$410,000.
- Raw materials were requisitioned for use in production, \$380,000 (\$360,000 direct materials and \$20,000 indirect materials).

- c. The following costs were accrued for employee services: direct labor, \$75,000; indirect labor, \$110,000; sales commissions, \$90,000; and administrative salaries, \$200,000.
- d. Sales travel costs were \$17,000.
- e. Utility costs in the factory were \$43,000.
- f. Advertising costs were \$180,000.
- g. Depreciation was recorded for the year, \$350,000 (80% relates to factory operations, and 20% relates to selling and administrative activities).
- h. Insurance expired during the year, \$10,000 (70% relates to factory operations, and the remaining 30% relates to selling and administrative activities).
- i. Manufacturing overhead was applied to production. Due to greater than expected demand for its products, the company worked 80,000 machine-hours during the year.
- j. Goods costing \$900,000 to manufacture according to their job cost sheets were completed during the year.
- k. Goods were sold on account to customers during the year for a total of \$1,500,000. The goods cost \$870,000 to manufacture according to their job cost sheets.

Required:

1. Prepare journal entries to record the preceding transactions.
2. Post the entries in (1) above to T-accounts (don't forget to enter the beginning balances in the inventory accounts).
3. Is Manufacturing Overhead underapplied or overapplied for the year? Prepare a journal entry to close any balance in the Manufacturing Overhead account to Cost of Goods Sold.
4. Prepare an income statement for the year.

Solution to Review Problem

1. a.	Raw Materials.....	410,000	
	Accounts Payable		410,000
b.	Work in Process	360,000	
	Manufacturing Overhead	20,000	
	Raw Materials		380,000
c.	Work in Process	75,000	
	Manufacturing Overhead	110,000	
	Sales Commissions Expense	90,000	
	Administrative Salaries Expense	200,000	
	Salaries and Wages Payable.....		475,000
d.	Sales Travel Expense.....	17,000	
	Accounts Payable		17,000
e.	Manufacturing Overhead	43,000	
	Accounts Payable		43,000
f.	Advertising Expense.....	180,000	
	Accounts Payable		180,000
g.	Manufacturing Overhead.....	280,000	
	Depreciation Expense	70,000	
	Accumulated Depreciation		350,000
h.	Manufacturing Overhead	7,000	
	Insurance Expense.....	3,000	
	Prepaid Insurance.....		10,000
i.	The predetermined overhead rate for the year is computed as follows:		

$$\begin{aligned}
 \text{Predetermined overhead rate} &= \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total amount of the allocation base}} \\
 &= \frac{\$450,000}{75,000 \text{ machine-hours}} \\
 &= \$6 \text{ per machine-hour}
 \end{aligned}$$

Based on the 80,000 machine-hours actually worked during the year, the company applied \$480,000 in overhead cost to production: \$6 per machine-hour × 80,000 machine-hours = \$480,000. The following entry records this application of overhead cost:

Work in Process	480,000	
Manufacturing Overhead		480,000
j. Finished Goods	900,000	
Work in Process		900,000
k. Accounts Receivable	1,500,000	
Sales		1,500,000
Cost of Goods Sold	870,000	
Finished Goods		870,000

2.

Accounts Receivable		Manufacturing Overhead		Sales	
(k) 1,500,000		(b) 20,000	(i) 480,000		(k) 1,500,000
Prepaid Insurance		(c) 110,000		Cost of Goods Sold	
	(h) 10,000	(e) 43,000		(k) 870,000	
Raw Materials		(g) 280,000		Sales Commissions Expense	
Bal. 20,000	(b) 380,000	(h) 7,000		(c) 90,000	
(a) 410,000		460,000	480,000	Administrative Salaries Expense	
Bal. 50,000			Bal. 20,000	(c) 200,000	
Work in Process		Accumulated Depreciation		Sales Travel Expense	
Bal. 15,000	(j) 900,000		(g) 350,000	(d) 17,000	
(b) 360,000		Accounts Payable		Advertising Expense	
(c) 75,000			(a) 410,000	(f) 180,000	
(i) 480,000			(d) 17,000	Depreciation Expense	
Bal. 30,000			(e) 43,000	(g) 70,000	
Finished Goods			(f) 180,000	Insurance Expense	
Bal. 30,000	(k) 870,000	Salaries and Wages Payable		(h) 3,000	
(j) 900,000			(c) 475,000		
Bal. 60,000					

3. Manufacturing overhead is overapplied for the year. The entry to close it out to Cost of Goods Sold is as follows:

Manufacturing Overhead	20,000	
Cost of Goods Sold		20,000

4.

Hogle Corporation Income Statement For the Year Ended December 31		
Sales		\$1,500,000
Cost of goods sold (\$870,000 – \$20,000)		<u>850,000</u>
Gross margin		650,000
Selling and administrative expenses:		
Sales commissions expense	\$ 90,000	
Administrative salaries expense	200,000	
Sales travel expense	17,000	
Advertising expense.....	180,000	
Depreciation expense	70,000	
Insurance expense	<u>3,000</u>	<u>560,000</u>
Net operating income		<u>\$ 90,000</u>

GLOSSARY

- Absorption costing** A costing method that includes all manufacturing costs—direct materials, direct labor, and both variable and fixed manufacturing overhead—in the cost of a product. (p. 76)
- Allocation base** A measure of activity such as direct labor-hours or machine-hours that is used to assign costs to cost objects. (p. 82)
- Bill of materials** A document that shows the quantity of each type of direct material required to make a product. (p. 79)
- Cost driver** A factor, such as machine-hours, beds occupied, computer time, or flight-hours, that causes overhead costs. (p. 84)
- Job cost sheet** A form prepared for a job that records the materials, labor, and manufacturing overhead costs charged to that job. (p. 80)
- Job-order costing** A costing system used in situations where many different products, jobs, or services are produced each period. (p. 77)
- Materials requisition form** A document that specifies the type and quantity of materials to be drawn from the storeroom and that identifies the job that will be charged for the cost of those materials. (p. 79)
- Multiple predetermined overhead rates** A costing system with multiple overhead cost pools and a different predetermined overhead rate for each cost pool, rather than a single predetermined overhead rate for the entire company. Each production department may be treated as a separate overhead cost pool. (p. 102)
- Normal cost system** A costing system in which overhead costs are applied to a job by multiplying a predetermined overhead rate by the actual amount of the allocation base incurred by the job. (p. 83)
- Overapplied overhead** A credit balance in the Manufacturing Overhead account that occurs when the amount of overhead cost applied to Work in Process exceeds the amount of overhead cost actually incurred during a period. (p. 98)
- Overhead application** The process of charging manufacturing overhead cost to job cost sheets and to the Work in Process account. (p. 83)
- Plantwide overhead rate** A single predetermined overhead rate that is used throughout a plant. (p. 102)
- Predetermined overhead rate** A rate used to charge manufacturing overhead cost to jobs that is established in advance for each period. It is computed by dividing the estimated total manufacturing overhead cost for the period by the estimated total amount of the allocation base for the period. (p. 82)
- Process costing** A costing system used in situations where a single, homogeneous product (such as cement or flour) is produced for long periods of time. (p. 76)
- Time ticket** A document that is used to record the amount of time an employee spends on various activities. (p. 81)
- Underapplied overhead** A debit balance in the Manufacturing Overhead account that occurs when the amount of overhead cost actually incurred exceeds the amount of overhead cost applied to Work in Process during a period. (p. 98)

QUESTIONS

- 2-1 Why aren't actual manufacturing overhead costs traced to jobs just as direct materials and direct labor costs are traced to jobs?
- 2-2 When would job-order costing be used instead of process costing?
- 2-3 What is the purpose of the job cost sheet in a job-order costing system?
- 2-4 What is a predetermined overhead rate, and how is it computed?
- 2-5 Explain how a sales order, a production order, a materials requisition form, and a labor time ticket are involved in producing and costing products.
- 2-6 Explain why some production costs must be assigned to products through an allocation process.
- 2-7 Why do companies use predetermined overhead rates rather than actual manufacturing overhead costs to apply overhead to jobs?
- 2-8 What factors should be considered in selecting a base to be used in computing the predetermined overhead rate?
- 2-9 If a company fully allocates all of its overhead costs to jobs, does this guarantee that a profit will be earned for the period?
- 2-10 What account is credited when overhead cost is applied to Work in Process? Would you expect the amount applied for a period to equal the actual overhead costs of the period? Why or why not?
- 2-11 What is underapplied overhead? Overapplied overhead? What disposition is made of these amounts at the end of the period?
- 2-12 Provide two reasons why overhead might be underapplied in a given year.
- 2-13 What adjustment is made for underapplied overhead on the schedule of cost of goods sold? What adjustment is made for overapplied overhead?
- 2-14 What is a plantwide overhead rate? Why are multiple overhead rates, rather than a plantwide overhead rate, used in some companies?
- 2-15 What happens to overhead rates based on direct labor when automated equipment replaces direct labor?



Multiple-choice questions are provided on the text website at www.mhhe.com/brewer5e.

BRIEF EXERCISES connect

BRIEF EXERCISE 2-1 Process Costing and Job-Order Costing [LO1]

Which method of determining product costs, job-order costing or process costing, would be more appropriate in each of the following situations?

- An Elmer's glue factory.
- A textbook publisher such as McGraw-Hill.
- An Exxon oil refinery.
- A facility that makes Minute Maid frozen orange juice.
- A Scott paper mill.
- A custom home builder.
- A shop that customizes vans.
- A manufacturer of specialty chemicals.
- An auto repair shop.
- A Firestone tire manufacturing plant.
- An advertising agency.
- A law office.

BRIEF EXERCISE 2-2 Job-Order Costing Documents [LO2]

Cycle Gear Corporation has incurred the following costs on job number W456, an order for 20 special sprockets to be delivered at the end of next month.

Direct materials:

On April 10, requisition number 15673 was issued for 20 titanium blanks to be used in the special order. The blanks cost \$15.00 each.

On April 11, requisition number 15678 was issued for 480 hardened nibs also to be used in the special order. The nibs cost \$1.25 each.

Direct labor:

On April 12, Jamie Unser worked from 11:00 am until 2:45 pm on Job W456. He is paid \$9.60 per hour.

On April 18, Melissa Chan worked from 8:15 am until 11:30 am on Job W456. She is paid \$12.20 per hour.

Required:

1. On what documents would these costs be recorded?
2. How much cost should have been recorded on each of the documents for Job W456?

BRIEF EXERCISE 2-3 Compute the Predetermined Overhead Rate [LO3]

Harris Fabrics computes its predetermined overhead rate annually on the basis of direct labor hours. At the beginning of the year it estimated that its total manufacturing overhead would be \$134,000 and the total direct labor would be 20,000 hours. Its actual total manufacturing overhead for the year was \$123,900 and its actual total direct labor was 21,000 hours.

Required:

Compute the company's predetermined overhead rate for the year.

BRIEF EXERCISE 2-4 Prepare Journal Entries [LO4]

Larned Corporation recorded the following transactions for the just completed month.

- a. \$80,000 in raw materials were purchased on account.
- b. \$71,000 in raw materials were requisitioned for use in production. Of this amount, \$62,000 was for direct materials and the remainder was for indirect materials.
- c. Total labor wages of \$112,000 were incurred. Of this amount, \$101,000 was for direct labor and the remainder was for indirect labor.
- d. Additional manufacturing overhead costs of \$175,000 were incurred.

Required:

Record the above transactions in journal entries.

BRIEF EXERCISE 2-5 Apply Overhead [LO5]

Luthan Company uses a predetermined overhead rate of \$23.40 per direct labor-hour. This predetermined rate was based on 11,000 estimated direct labor-hours and \$257,400 of estimated total manufacturing overhead.

The company incurred actual total manufacturing overhead costs of \$249,000 and 10,800 total direct labor-hours during the period.

Required:

Determine the amount of manufacturing overhead that would have been applied to units of product during the period.

BRIEF EXERCISE 2-6 Schedules of Cost of Goods Manufactured and Cost of Goods Sold [LO6]

Primare Corporation has provided the following data concerning last month's manufacturing operations.

Purchases of raw materials	\$30,000
Indirect materials included in manufacturing overhead	\$5,000
Direct labor	\$58,000
Manufacturing overhead applied to work in process	\$87,000
Underapplied overhead	\$4,000

Inventories	Beginning	Ending
Raw materials.....	\$12,000	\$18,000
Work in process.....	\$56,000	\$65,000
Finished goods	\$35,000	\$42,000

Required:

1. Prepare a schedule of cost of goods manufactured for the month.
2. Prepare a schedule of cost of goods sold for the month.

BRIEF EXERCISE 2-7 Prepare T-accounts [LO7, LO8]

Jurvin Enterprises recorded the following transactions for the just completed month. The company had no beginning inventories.

- a. \$94,000 in raw materials were purchased for cash.
- b. \$89,000 in raw materials were requisitioned for use in production. Of this amount, \$78,000 was for direct materials and the remainder was for indirect materials.
- c. Total labor wages of \$132,000 were incurred and paid. Of this amount, \$112,000 was for direct labor and the remainder was for indirect labor.

- d. Additional manufacturing overhead costs of \$143,000 were incurred and paid.
- e. Manufacturing overhead costs of \$152,000 were applied to jobs using the company's predetermined overhead rate.
- f. All of the jobs in progress at the end of the month were completed and shipped to customers.
- g. Any underapplied or overapplied overhead for the period was closed out to Cost of Goods Sold.

Required:

- 1. Post the above transactions to T-accounts.
- 2. Determine the cost of goods sold for the period.

BRIEF EXERCISE 2-8 Underapplied and Overapplied Overhead [LO8]

Osborn Manufacturing uses a predetermined overhead rate of \$18.20 per direct labor-hour. This predetermined rate was based on 12,000 estimated direct labor-hours and \$218,400 of estimated total manufacturing overhead.

The company incurred actual total manufacturing overhead costs of \$215,000 and 11,500 total direct labor-hours during the period.

Required:

- 1. Determine the amount of underapplied or overapplied manufacturing overhead for the period.
- 2. Assuming that the entire amount of the underapplied or overapplied overhead is closed out to Cost of Goods Sold, what would be the effect of the underapplied or overapplied overhead on the company's gross margin for the period?

EXERCISES



EXERCISE 2-9 Applying Overhead to a Job [LO5]

Sigma Corporation applies overhead cost to jobs on the basis of direct labor cost. Job V, which was started and completed during the current period, shows charges of \$5,000 for direct materials, \$8,000 for direct labor, and \$6,000 for overhead on its job cost sheet. Job W, which is still in process at year-end, shows charges of \$2,500 for direct materials and \$4,000 for direct labor.

Required:

Should any overhead cost be added to Job W at year-end? If so, how much? Explain.

EXERCISE 2-10 Predetermined Overhead Rate; Applying Overhead; Underapplied or Overapplied Overhead [LO3, LO5, LO8]

Estimated cost and operating data for three companies for the upcoming year follow:

	Company X	Company Y	Company Z
Direct labor-hours.....	80,000	45,000	60,000
Machine-hours.....	30,000	70,000	21,000
Direct materials cost.....	\$400,000	\$290,000	\$300,000
Manufacturing overhead cost.....	\$536,000	\$315,000	\$480,000

Predetermined overhead rates are computed using the following allocation bases in the three companies:

	Allocation Base
Company X.....	Direct labor-hours
Company Y.....	Machine-hours
Company Z.....	Direct materials cost

Required:

- 1. Compute each company's predetermined overhead rate.
- 2. Assume that Company X works on three jobs during the upcoming year. Direct labor-hours recorded by job are: Job 418, 12,000 hours; Job 419, 36,000 hours; and Job 420, 30,000 hours. How much overhead will the company apply to Work in Process for the year? If actual overhead costs total \$530,000 for the year, will overhead be underapplied or overapplied? By how much?

EXERCISE 2-11 Applying Overhead; Journal Entries; Disposition of Underapplied or Overapplied Overhead [LO4, LO7, LO8]

The following information is taken from the accounts of Latta Company. The entries in the T-accounts are summaries of the transactions that affected those accounts during the year.



Manufacturing Overhead		Work in Process	
(a) 460,000	(b) 390,000	Bal. 15,000	(c) 710,000
Bal. 70,000		260,000	
		85,000	
		(b) 390,000	
		Bal. 40,000	
Finished Goods		Cost of Goods Sold	
Bal. 50,000	(d) 640,000	(d) 640,000	
(c) 710,000			
Bal. 120,000			

The overhead that had been applied to production during the year is distributed among the ending balances in the accounts as follows:

Work in Process, ending	\$ 19,500
Finished Goods, ending.....	58,500
Cost of Goods Sold	312,000
Overhead applied	<u>\$390,000</u>

For example, of the \$40,000 ending balance in Work in Process, \$19,500 was overhead that had been applied during the year.

Required:

- Identify reasons for entries (a) through (d).
- Assume that the company closes any balance in the Manufacturing Overhead account directly to Cost of Goods Sold. Prepare the necessary journal entry.

EXERCISE 2-12 Applying Overhead; T-accounts; Journal Entries [LO3, LO4, LO5, LO7, LO8]

Harwood Company uses a job-order costing system. Overhead costs are applied to jobs on the basis of machine-hours. At the beginning of the year, management estimated that the company would incur \$192,000 in manufacturing overhead costs and work 80,000 machine-hours.

**Required:**

- Compute the company's predetermined overhead rate.
- Assume that during the year the company works only 75,000 machine-hours and incurs the following costs in the Manufacturing Overhead and Work in Process accounts:

Manufacturing Overhead		Work in Process	
(Maintenance)	21,000	(Direct materials)	710,000
(Indirect materials)	8,000	(Direct labor)	90,000
(Indirect labor)	60,000	(Overhead)	?
(Utilities)	32,000		
(Insurance)	7,000		
(Depreciation)	56,000		

Copy the data in the T-accounts above onto your answer sheet. Compute the amount of overhead cost that would be applied to Work in Process for the year and make the entry in your T-accounts.

3. Compute the amount of underapplied or overapplied overhead for the year and show the balance in your Manufacturing Overhead T-account. Prepare a journal entry to close out the balance in this account to Cost of Goods Sold.
4. Explain why the manufacturing overhead was underapplied or overapplied for the year.

EXERCISE 2-13 Applying Overhead; Computing Unit Product Cost [LO5]

A company assigns overhead cost to completed jobs on the basis of 125% of direct labor cost. The job cost sheet for Job 313 shows that \$10,000 in direct materials has been used on the job and that \$12,000 in direct labor cost has been incurred. A total of 1,000 units were produced in Job 313.

Required:

What is the unit product cost for Job 313?

EXERCISE 2-14 Journal Entries and T-accounts [LO4, LO5, LO7]

The Polaris Company uses a job-order costing system. The following data relate to October, the first month of the company's fiscal year.

- a. Raw materials purchased on account, \$210,000.
- b. Raw materials issued to production, \$190,000 (\$178,000 direct materials and \$12,000 indirect materials).
- c. Direct labor cost incurred, \$90,000; indirect labor cost incurred, \$110,000.
- d. Depreciation recorded on factory equipment, \$40,000.
- e. Other manufacturing overhead costs incurred during October, \$70,000 (credit Accounts Payable).
- f. The company applies manufacturing overhead cost to production on the basis of \$8 per machine-hour. A total of 30,000 machine-hours were recorded for October.
- g. Production orders costing \$520,000 according to their job cost sheets were completed during October and transferred to Finished Goods.
- h. Production orders that had cost \$480,000 to complete according to their job cost sheets were shipped to customers during the month. These goods were sold on account at 25% above cost.

Required:

1. Prepare journal entries to record the information given above.
2. Prepare T-accounts for Manufacturing Overhead and Work in Process. Post the relevant information above to each account. Compute the ending balance in each account, assuming that Work in Process has a beginning balance of \$42,000.



EXERCISE 2-15 Applying Overhead in a Service Company [LO2, LO3, LO5]

Leeds Architectural Consultants began operations on January 2. The following activity was recorded in the company's Work in Process account for the first month of operations:

Work in Process			
Costs of subcontracted work	230,000	To completed projects	390,000
Direct staff costs	75,000		
Studio overhead	120,000		

Leeds Architectural Consultants is a service firm, so the names of the accounts it uses are different from the names used in manufacturing companies. Costs of Subcontracted Work is comparable to Direct Materials; Direct Staff Costs is the same as Direct Labor; Studio Overhead is the same as Manufacturing Overhead; and Completed Projects is the same as Finished Goods. Apart from the difference in terms, the accounting methods used by the company are identical to the methods used by manufacturing companies.

Leeds Architectural Consultants uses a job-order costing system and applies studio overhead to Work in Process on the basis of direct staff costs. At the end of January, only one job was still in process. This job (Lexington Gardens Project) had been charged with \$6,500 in direct staff costs.

Required:

1. Compute the predetermined overhead rate that was in use during January.
2. Complete the following job cost sheet for the partially completed Lexington Gardens Project.

**Job Cost Sheet—Lexington Gardens Project
As of January 31**

Costs of subcontracted work	\$?
Direct staff costs	?
Studio overhead	<u>?</u>
Total cost to January 31	<u>\$?</u>

EXERCISE 2-16 Applying Overhead; Journal Entries; T-accounts [LO3, LO4, LO5, LO7]

Dillon Products manufactures various machined parts to customer specifications. The company uses a job-order costing system and applies overhead cost to jobs on the basis of machine-hours. At the beginning of the year, it was estimated that the company would work 240,000 machine-hours and incur \$4,800,000 in manufacturing overhead costs.

The company spent the entire month of January working on a large order for 16,000 custom made machined parts. The company had no work in process at the beginning of January. Cost data relating to January follow:

- Raw materials purchased on account, \$325,000.
- Raw materials requisitioned for production, \$290,000 (80% direct materials and 20% indirect materials).
- Labor cost incurred in the factory, \$180,000 (one-third direct labor and two-thirds indirect labor).
- Depreciation recorded on factory equipment, \$75,000.
- Other manufacturing overhead costs incurred, \$62,000 (credit Accounts Payable).
- Manufacturing overhead cost was applied to production on the basis of 15,000 machine-hours actually worked during the month.
- The completed job was moved into the finished goods warehouse on January 31 to await delivery to the customer. (In computing the dollar amount for this entry, remember that the cost of a completed job consists of direct materials, direct labor, and *applied* overhead.)

Required:

- Prepare journal entries to record items (a) through (f) above [ignore item (g) for the moment].
- Prepare T-accounts for Manufacturing Overhead and Work in Process. Post the relevant items from your journal entries to these T-accounts.
- Prepare a journal entry for item (g) above.
- Compute the unit product cost that will appear on the job cost sheet.

EXERCISE 2-17 Applying Overhead; Cost of Goods Manufactured [LO5, LO6, LO8]

The following cost data relate to the manufacturing activities of Chang Company during the just completed year:

Manufacturing overhead costs incurred:	
Indirect materials	\$ 15,000
Indirect labor	130,000
Property taxes, factory	8,000
Utilities, factory	70,000
Depreciation, factory	240,000
Insurance, factory	<u>10,000</u>
Total actual manufacturing overhead costs incurred	<u>\$473,000</u>
Other costs incurred:	
Purchases of raw materials (both direct and indirect)	\$400,000
Direct labor cost	\$60,000
Inventories:	
Raw materials, beginning	\$20,000
Raw materials, ending	\$30,000
Work in process, beginning	\$40,000
Work in process, ending	\$70,000

The company uses a predetermined overhead rate to apply overhead cost to production. The rate for the year was \$25 per machine-hour. A total of 19,400 machine-hours was recorded for the year.

Required:

1. Compute the amount of underapplied or overapplied overhead cost for the year.
2. Prepare a schedule of cost of goods manufactured for the year.

**EXERCISE 2-18 Varying Predetermined Overhead Rates [LO3, LO5]**

Kingsport Containers, Ltd, of the Bahamas experiences wide variation in demand for the 200-liter steel drums it fabricates. The leakproof, rustproof steel drums have a variety of uses from storing liquids and bulk materials to serving as makeshift musical instruments. The drums are made to order and are painted according to the customer's specifications—often in bright patterns and designs. The company is well known for the artwork that appears on its drums. Unit product costs are computed on a quarterly basis by dividing each quarter's manufacturing costs (materials, labor, and overhead) by the quarter's production in units. The company's estimated costs, by quarter, for the coming year follow:

	Quarter			
	First	Second	Third	Fourth
Direct materials.....	\$240,000	\$120,000	\$60,000	\$180,000
Direct labor.....	128,000	64,000	32,000	96,000
Manufacturing overhead.....	300,000	220,000	180,000	260,000
Total manufacturing costs.....	<u>\$668,000</u>	<u>\$404,000</u>	<u>\$272,000</u>	<u>\$536,000</u>
Number of units to be produced.....	80,000	40,000	20,000	60,000
Estimated unit product cost.....	\$8.35	\$10.10	\$13.60	\$8.93

Management finds the variation in unit costs confusing and difficult to work with. It has been suggested that the problem lies with manufacturing overhead because it is the largest element of cost. Accordingly, you have been asked to find a more appropriate way of assigning manufacturing overhead cost to units of product. After some analysis, you have determined that the company's overhead costs are mostly fixed and therefore show little sensitivity to changes in the level of production.

Required:

1. The company uses a job-order costing system. How would you recommend that manufacturing overhead cost be assigned to production? Be specific, and show computations.
2. Recompute the company's unit product costs in accordance with your recommendations in (1) above.

PROBLEMS

Alternate problem set is available on the text website.

CHECK FIGURE

- (4) Overhead is underapplied by \$2,100

**PROBLEM 2-19A Applying Overhead in a Service Company; Journal Entries [LO4, LO5, LO8]**

Vista Landscaping uses a job-order costing system to track the costs of its landscaping projects. The company provides garden design and installation services for its clients. The table below provides data concerning the three landscaping projects that were in progress during April. There was no work in process at the beginning of April.

	Project		
	Harris	Chan	James
Designer-hours.....	120	100	90
Direct materials cost.....	\$4,500	\$3,700	\$1,400
Direct labor cost.....	\$9,600	\$8,000	\$7,200

Actual overhead costs were \$30,000 for April. Overhead costs are applied to projects on the basis of designer-hours because most of the overhead is related to the costs of the garden design studio. The predetermined overhead rate is \$90 per designer-hour. The Harris and Chan projects were completed in April; the James project was not completed by the end of the month.

Required:

1. Compute the amount of overhead cost that would have been charged to each project during April.
2. Prepare a journal entry showing the completion of the Harris and Chan projects and the transfer of costs to the Completed Projects (i.e., Finished Goods) account.
3. What is the balance in the Work in Process account at the end of the month?
4. What is the balance in the Overhead account at the end of the month? What is this balance called?

PROBLEM 2-20A Departmental Overhead Rates [LO2, LO3, LO5]

White Company has two departments, Cutting and Finishing. The company uses a job-order costing system and computes a predetermined overhead rate in each department. The Cutting Department bases its rate on machine-hours, and the Finishing Department bases its rate on direct labor cost. At the beginning of the year, the company made the following estimates:

	Department	
	Cutting	Finishing
Direct labor-hours	6,000	30,000
Machine-hours	48,000	5,000
Materials overhead cost	\$360,000	\$486,000
Direct labor cost	\$50,000	\$270,000

CHECK FIGURE

- (2) Total overhead applied to Job 203: \$870



excel

Required:

1. Compute the predetermined overhead rate to be used in each department.
2. Assume that the overhead rates that you computed in (1) above are in effect. The job cost sheet for Job 203, which was started and completed during the year, showed the following:

	Department	
	Cutting	Finishing
Direct labor-hours	6	20
Machine-hours	80	4
Materials requisitioned	\$500	\$310
Direct labor cost	\$70	\$150

Compute the total overhead cost applied to Job 203.

3. Would you expect substantially different amounts of overhead cost to be assigned to some jobs if the company used a plantwide overhead rate based on direct labor cost, rather than using departmental rates? Explain. No computations are necessary.

PROBLEM 2-21A Comprehensive Problem [LO3, LO4, LO5, LO7, LO8]

Gold Nest Company of Guangdong, China, is a family-owned enterprise that makes birdcages for the South China market. A popular pastime among older Chinese men is to take their pet birds on daily excursions to teahouses and public parks where they meet with other bird owners to talk and play mahjong. A great deal of attention is lavished on these birds, and the birdcages are often elaborately constructed from exotic woods and contain porcelain feeding bowls and silver roosts. Gold Nest Company makes a broad range of birdcages that it sells through an extensive network of street vendors who receive commissions on their sales. The Chinese currency is the renminbi, which is denoted by Rmb. All of the company's transactions with customers, employees, and suppliers are conducted in cash; there is no credit.

The company uses a job-order costing system in which overhead is applied to jobs on the basis of direct labor cost. At the beginning of the year, it was estimated that the total direct labor cost for the year

CHECK FIGURE

- (3) Overapplied by Rmb7,000;
 (4) Net operating income: Rmb247,000

would be Rmb200,000 and the total manufacturing overhead cost would be Rmb330,000. At the beginning of the year, the inventory balances were as follows:

Raw materials	Rmb25,000
Work in process.....	Rmb10,000
Finished goods	Rmb40,000

During the year, the following transactions were completed:

- Raw materials purchased for cash, Rmb275,000.
- Raw materials requisitioned for use in production, Rmb280,000 (materials costing Rmb220,000 were charged directly to jobs; the remaining materials were indirect).
- Costs for employee services were incurred as follows:

Direct labor	Rmb180,000
Indirect labor.....	Rmb72,000
Sales commissions	Rmb63,000
Administrative salaries	Rmb90,000

- Rent for the year was Rmb18,000 (Rmb13,000 of this amount related to factory operations, and the remainder related to selling and administrative activities).
- Utility costs incurred in the factory, Rmb57,000.
- Advertising costs incurred, Rmb140,000.
- Depreciation recorded on equipment, Rmb100,000. (Rmb88,000 of this amount was on equipment used in factory operations; the remaining Rmb12,000 was on equipment used in selling and administrative activities.)
- Manufacturing overhead cost was applied to jobs, Rmb ____?
- Goods that had cost Rmb675,000 to manufacture according to their job cost sheets were completed.
- Sales for the year totaled Rmb1,250,000. The total cost to manufacture these goods according to their job cost sheets was Rmb700,000.

Required:

- Prepare journal entries to record the transactions for the year.
- Prepare T-accounts for inventories, Manufacturing Overhead, and Cost of Goods Sold. Post relevant data from your journal entries to these T-accounts (don't forget to enter the beginning balances in your inventory accounts). Compute an ending balance in each account.
- Is Manufacturing Overhead underapplied or overapplied for the year? Prepare a journal entry to close any balance in the Manufacturing Overhead account to Cost of Goods Sold.
- Prepare an income statement for the year. (Do not prepare a schedule of cost of goods manufactured; all of the information needed for the income statement is available in the journal entries and T-accounts you have prepared.)

CHECK FIGURE

- Underapplied by \$4,000;
- Net operating income: \$57,000

PROBLEM 2-22A Journal Entries; T-accounts; Cost Flows [LO4, LO5, LO7]

Almeda Products, Inc., uses a job-order costing system. The company's inventory balances on April 1, the start of its fiscal year, were as follows:

Raw materials	\$32,000
Work in process.....	\$20,000
Finished goods	\$48,000

During the year, the following transactions were completed:

- Raw materials were purchased on account, \$170,000.
- Raw materials were issued from the storeroom for use in production, \$180,000 (80% direct and 20% indirect).
- Employee salaries and wages were accrued as follows: direct labor, \$200,000; indirect labor, \$82,000; and selling and administrative salaries, \$90,000.
- Utility costs were incurred in the factory, \$65,000.
- Advertising costs were incurred, \$100,000.
- Prepaid insurance expired during the year, \$20,000 (90% related to factory operations, and 10% related to selling and administrative activities).

- g. Depreciation was recorded, \$180,000 (85% related to factory assets, and 15% related to selling and administrative assets).
- h. Manufacturing overhead was applied to jobs at the rate of 175% of direct labor cost.
- i. Goods that cost \$700,000 to manufacture according to their job cost sheets were transferred to the finished goods warehouse.
- j. Sales for the year totaled \$1,000,000 and were all on account. The total cost to manufacture these goods according to their job cost sheets was \$720,000.

Required:

1. Prepare journal entries to record the transactions for the year.
2. Prepare T-accounts for Raw Materials, Work in Process, Finished Goods, Manufacturing Overhead, and Cost of Goods Sold. Post the appropriate parts of your journal entries to these T-accounts. Compute the ending balance in each account. (Don't forget to enter the beginning balances in the inventory accounts.)
3. Is Manufacturing Overhead underapplied or overapplied for the year? Prepare a journal entry to close this balance to Cost of Goods Sold.
4. Prepare an income statement for the year. (Do not prepare a schedule of cost of goods manufactured; all of the information needed for the income statement is available in the journal entries and T-accounts you have prepared.)

PROBLEM 2-23A Schedule of Cost of Goods Manufactured; Overhead Analysis [LO3, LO5, LO6, LO7]

Gitano Products operates a job-order costing system and applies overhead cost to jobs on the basis of direct materials *used in production* (not on the basis of raw materials purchased). All materials are classified as direct materials. In computing a predetermined overhead rate at the beginning of the year, the company's estimates were: manufacturing overhead cost, \$800,000; and direct materials to be used in production, \$500,000. The company has provided the following data in the form of an Excel worksheet:

CHECK FIGURE
(2) Cost of goods manufactured:
\$1,340,000

excel

	A	B	C
1		Beginning	Ending
2	Raw Materials	\$20,000	\$80,000
3	Work in Process	\$150,000	\$70,000
4	Finished Goods	\$260,000	\$400,000
5			
6	The following actual costs were incurred during the year:		
7	Purchase of raw materials (all direct)		\$510,000
8	Direct labor cost		\$90,000
9	Manufacturing overhead costs:		
10	Indirect labor		\$170,000
11	Property taxes		\$48,000
12	Depreciation of equipment		\$260,000
13	Maintenance		\$95,000
14	Insurance		\$7,000
15	Rent, building		\$180,000
16			

Required:

1. a. Compute the predetermined overhead rate for the year.
h. Compute the amount of underapplied or overapplied overhead for the year.
2. Prepare a schedule of cost of goods manufactured for the year.
3. Compute the Cost of Goods Sold for the year. (Do not include any underapplied or overapplied overhead in your Cost of Goods Sold figure.) What options are available for disposing of underapplied or overapplied overhead?
4. Job 215 was started and completed during the year. What price would have been charged to the customer if the job required \$8,500 in direct materials and \$2,700 in direct labor cost and the company priced its jobs at 25% above the job's cost according to the accounting system?

5. Direct materials made up \$24,000 of the \$70,000 ending Work in Process inventory balance. Supply the information missing below:

Direct materials	\$24,000
Direct labor	?
Manufacturing overhead	?
Work in process inventory	<u>\$70,000</u>

CHECK FIGURE
(3) \$78.16 per unit



PROBLEM 2-24A Multiple Departments; Applying Overhead [LO3, LO5, LO8]

High Desert Potteryworks makes a variety of pottery products that it sells to retailers such as Home Depot. The company uses a job-order costing system in which predetermined overhead rates are used to apply manufacturing overhead cost to jobs. The predetermined overhead rate in the Molding Department is based on machine-hours, and the rate in the Painting Department is based on direct labor cost. At the beginning of the year, the company's management made the following estimates:

	Department	
	Molding	Painting
Direct labor-hours	12,000	60,000
Machine-hours	70,000	8,000
Direct materials cost	\$510,000	\$650,000
Direct labor cost	\$130,000	\$420,000
Manufacturing overhead cost	\$602,000	\$735,000

Job 205 was started on August 1 and completed on August 10. The company's cost records show the following information concerning the job:

	Department	
	Molding	Painting
Direct labor-hours	30	85
Machine-hours	110	20
Materials placed into production	\$470	\$332
Direct labor cost	\$290	\$680

Required:

1. Compute the predetermined overhead rate used during the year in the Molding Department. Compute the rate used in the Painting Department.
2. Compute the total overhead cost applied to Job 205.
3. What would be the total cost recorded for Job 205? If the job contained 50 units, what would be the unit product cost?
4. At the end of the year, the records of High Desert Potteryworks revealed the following *actual* cost and operating data for all jobs worked on during the year:

	Department	
	Molding	Painting
Direct labor-hours	10,000	62,000
Machine-hours	65,000	9,000
Direct materials cost	\$430,000	\$680,000
Direct labor cost	\$108,000	\$436,000
Manufacturing overhead cost	\$570,000	\$750,000

What was the amount of underapplied or overapplied overhead in each department at the end of the year?

PROBLEM 2–25A T-Account Analysis of Cost Flows [LO3, LO6, LO8]

Selected T-accounts of Moore Company are given below for the just completed year:

CHECK FIGURE(3) Indirect labor: \$30,000;
(7) Overapplied:
\$10,000

Raw Materials			Manufacturing Overhead				
Bal. 1/1	15,000	Credits	?	Debits	230,000	Credits	?
Debits	120,000						
Bal. 12/31	25,000						
Work in Process			Factory Wages Payable				
Bal. 1/1	20,000	Credits	470,000	Debits	185,000	Bal. 1/1	9,000
Direct materials	90,000					Credits	180,000
Direct labor	150,000					Bal. 12/31	4,000
Overhead	240,000						
Bal. 12/31	?						
Finished Goods			Cost of Goods Sold				
Bal. 1/1	40,000	Credits	?	Debits	?		
Debits	?						
Bal. 12/31	60,000						

Required:

1. What was the cost of raw materials put into production during the year?
2. How much of the materials in (1) above consisted of indirect materials?
3. How much of the factory labor cost for the year consisted of indirect labor?
4. What was the cost of goods manufactured for the year?
5. What was the cost of goods sold for the year (before considering underapplied or overapplied overhead)?
6. If overhead is applied to production on the basis of direct labor cost, what rate was in effect during the year?
7. Was manufacturing overhead underapplied or overapplied? By how much?
8. Compute the ending balance in the Work in Process inventory account. Assume that this balance consists entirely of goods started during the year. If \$8,000 of this balance is direct labor cost, how much of it is direct materials cost? Manufacturing overhead cost?

BUILDING YOUR SKILLS**ETHICS CHALLENGE [LO3, LO5, LO8]**

Terri Ronsin had recently been transferred to the Home Security Systems Division of National Home Products. Shortly after taking over her new position as divisional controller, she was asked to develop the division's predetermined overhead rate for the upcoming year. The accuracy of the rate is important because it is used throughout the year and any overapplied or underapplied overhead is closed out to Cost of Goods Sold at the end of the year. National Home Products uses direct labor-hours in all of its divisions as the allocation base for manufacturing overhead.

To compute the predetermined overhead rate, Terri divided her estimate of the total manufacturing overhead for the coming year by the production manager's estimate of the total direct labor-hours for the coming year. She took her computations to the division's general manager for approval but was quite surprised when he suggested a modification in the base. Her conversation with the general manager of the Home Security Systems Division, Harry Irving, went like this:

Ronsin: Here are my calculations for next year's predetermined overhead rate. If you approve, we can enter the rate into the computer on January 1 and be up and running in the job-order costing system right away this year.



Irving: Thanks for coming up with the calculations so quickly, and they look just fine. There is, however, one slight modification I would like to see. Your estimate of the total direct labor-hours for the year is 440,000 hours. How about cutting that to about 420,000 hours?

Ronsin: I don't know if I can do that. The production manager says she will need about 440,000 direct labor-hours to meet the sales projections for the year. Besides, there are going to be over 430,000 direct labor-hours during the current year and sales are projected to be higher next year.

Irving: Terri, I know all of that. I would still like to reduce the direct labor-hours in the base to something like 420,000 hours. You probably don't know that I had an agreement with your predecessor as divisional controller to shave 5% or so off the estimated direct labor-hours every year. That way, we kept a reserve that usually resulted in a big boost to net operating income at the end of the fiscal year in December. We called it our Christmas bonus. Corporate headquarters always seemed pleased punch that we could pull off such a miracle at the end of the year. This system has worked well for many years, and I don't want to change it now.

Required:

1. Explain how shaving 5% off the estimated direct labor-hours in the base for the predetermined overhead rate usually results in a big boost in net operating income at the end of the fiscal year.
2. Should Terri Ronsin go along with the general manager's request to reduce the direct labor-hours in the predetermined overhead rate computation to 420,000 direct labor-hours?



ANALYTICAL THINKING [LO3, LO5]

Kelvin Aerospace, Inc., manufactures parts such as rudder hinges for the aerospace industry. The company uses a job-order costing system with a predetermined plantwide overhead rate based on direct labor-hours. On December 16, 2008, the company's controller made a preliminary estimate of the predetermined overhead rate for the year 2009. The new rate was based on the estimated total manufacturing overhead cost of \$3,402,000 and the estimated 63,000 total direct labor-hours for 2009:

$$\begin{aligned} \text{Predetermined overhead rate} &= \frac{\$3,402,000}{63,000 \text{ hours}} \\ &= \$54 \text{ per direct labor-hour} \end{aligned}$$

This new predetermined overhead rate was communicated to top managers in a meeting on December 19. The rate did not cause any comment because it was within a few pennies of the overhead rate that had been used during 2008. One of the subjects discussed at the meeting was a proposal by the production manager to purchase an automated milling machine built by Sunghi Industries. The president of Kelvin Aerospace, Harry Arcany, agreed to meet with the sales representative from Sunghi Industries to discuss the proposal.

On the day following the meeting, Mr. Arcany met with Jasmine Chang, Sunghi Industries' sales representative. The following discussion took place:

Arcany: Wally, our production manager, asked me to meet with you because he is interested in installing an automated milling machine. Frankly, I'm skeptical. You're going to have to show me this isn't just another expensive toy for Wally's people to play with.

Chang: This is a great machine with direct bottom-line benefits. The automated milling machine has three major advantages. First, it is much faster than the manual methods you are using. It can process about twice as many parts per hour as your present milling machines. Second, it is much more flexible. There are some up-front programming costs, but once those have been incurred, almost no setup is required to run a standard operation. You just punch in the code for the standard operation, load the machine's hopper with raw material, and the machine does the rest.

Arcany: What about cost? Having twice the capacity in the milling machine area won't do us much good. That center is idle much of the time anyway.

Chang: I was getting there. The third advantage of the automated milling machine is lower cost. Wally and I looked over your present operations, and we estimated that the automated equipment would eliminate the need for about 6,000 direct labor-hours a year. What is your direct labor cost per hour?

Arcany: The wage rate in the milling area averages about \$32 per hour. Fringe benefits raise that figure to about \$41 per hour.

Chang: Don't forget your overhead.

Arcany: Next year the overhead rate will be \$54 per hour.

Chang: So including fringe benefits and overhead, the cost per direct labor-hour is about \$95.

Arcany: That's right.

Chang: Since you can save 6,000 direct labor-hours per year, the cost savings would amount to about \$570,000 a year. And our 60-month lease plan would require payments of only \$348,000 per year.

Arcany: That sounds like a no-brainer. When can you install the equipment?

Shortly after this meeting, Mr. Arcany informed the company's controller of the decision to lease the new equipment, which would be installed over the Christmas vacation period. The controller realized that this decision would require a recomputation of the predetermined overhead rate for the year 2009 because the decision would affect both the manufacturing overhead and the direct labor-hours for the year. After talking with both the production manager and the sales representative from Sunghi Industries, the controller discovered that in addition to the annual lease cost of \$348,000, the new machine would also require a skilled technician/programmer who would have to be hired at a cost of \$50,000 per year to maintain and program the equipment. Both of these costs would be included in factory overhead. There would be no other changes in total manufacturing overhead cost, which is almost entirely fixed. The controller assumed that the new machine would result in a reduction of 6,000 direct labor-hours for the year from the levels that had initially been planned.

When the revised predetermined overhead rate for the year 2009 was circulated among the company's top managers, there was considerable dismay.

Required:

1. Recompute the predetermined rate assuming that the new machine will be installed. Explain why the new predetermined overhead rate is higher (or lower) than the rate that was originally estimated for the year 2009.
2. What effect (if any) would this new rate have on the cost of jobs that do not use the new automated milling machine?
3. Why would managers be concerned about the new overhead rate?
4. After seeing the new predetermined overhead rate, the production manager admitted that he probably wouldn't be able to eliminate all of the 6,000 direct labor-hours. He had been hoping to accomplish the reduction by not replacing workers who retire or quit, but that had not been possible. As a result, the real labor savings would be only about 2,000 hours--one worker. Given this additional information, evaluate the original decision to acquire the automated milling machine from Sunghi Industries.

TEAMWORK IN ACTION [LO3, LO4, LO5, LO7, LO8]

After a dispute concerning wages, Orville Arson tossed an incendiary device into the Sparkle Company's record vault. Within moments, only a few charred fragments were readable from the company's factory ledger, as shown below:

CHECK FIGURE

(3) WIP inventory: \$5,300

Raw Materials		Manufacturing Overhead	
Balance 4/1	12,000	Actual costs for April	14,800
Work in Process		Accounts Payable	
Balance 4/1	4,500		Balance 4/30 8,000
Finished Goods		Cost of Goods Sold	
Balance 4/30	16,000		

Sifting through ashes and interviewing selected employees has turned up the following additional information:

- a. The controller remembers clearly that the predetermined overhead rate was based on an estimated 60,000 direct labor-hours to be worked over the year and an estimated \$180,000 in manufacturing overhead costs.
- b. The production superintendent's cost sheets showed only one job in process on April 30. Materials of \$2,600 had been added to the job, and 300 direct labor-hours had been expended at \$6 per hour.

- c. The accounts payable are for raw material purchases only, according to the accounts payable clerk. He clearly remembers that the balance in the account was \$6,000 on April 1. An analysis of canceled checks (kept in the treasurer's office) shows that payments of \$40,000 were made to suppliers during April. (All materials used during April were direct materials.)
- d. A charred piece of the payroll ledger shows that 5,200 direct labor-hours were recorded for the month. The personnel department has verified that there were no variations in pay rates among employees. (This infuriated Orville, who felt that his services were underpaid.)
- e. Records maintained in the finished goods warehouse indicate that the finished goods inventory totaled \$11,000 on April 1.
- f. From another charred piece in the vault, you are able to discern that the cost of goods manufactured for April was \$89,000.

Required:

1. Assign one of the following sets of accounts to each member of the team:
 - a. Raw Materials and Accounts Payable.
 - b. Work in Process and Manufacturing Overhead.
 - c. Finished Goods and Cost of Goods Sold.
 Determine the types of transactions that would be posted to each account and present a summary to the other team members. When agreement is reached, the team should work together to complete steps 2 through 4.
2. Determine the company's predetermined overhead rate and the total manufacturing overhead applied for the month.
3. Determine the April 30 balance in the company's Work in Process account.
4. Prepare the company's T-accounts for the month. (It is easiest to complete the T-accounts in the following order: Accounts Payable, Work in Process, Raw Materials, Manufacturing Overhead, Finished Goods, Cost of Goods Sold.)

**COMMUNICATING IN PRACTICE [LO1, LO3, LO5]**

Look in the yellow pages or contact your local chamber of commerce or local chapter of the Institute of Management Accountants to find the names of manufacturing companies in your area. Call or make an appointment to meet with the controller or chief financial officer of one of these companies.

Required:

Ask the following questions and write a brief memorandum to your instructor that addresses what you found out.

1. What are the company's main products?
2. Does the company use job-order costing, process costing, or some other method of determining product costs?
3. How is overhead assigned to products? What is the overhead rate? What is the basis of allocation? Is more than one overhead rate used?
4. Has the company recently changed its cost system or is it considering changing its cost system? If so, why? What changes were made or what changes are being considered?

**RESEARCH AND APPLICATION**

[LO1, LO2, LO3]

The questions in this exercise are based on **Toll Brothers, Inc.**, one of the largest home builders in the United States. To answer the questions, you will need to download Toll Brothers' 2004 annual report (www.tollbrothers.com/homesearch/serlet/HomeSearch?app5lRannual) and its Form 10-K for the fiscal year ended October 31, 2004. To access the 10-K report, go to www.sec.gov/edgar/searchedgar/companysearch.html. Input CIK code 794170 and hit enter. In the gray box on the right-hand side of your computer screen define the scope of your search by inputting 10-K and then pressing enter. Select the 10-K with a filing date of January 13, 2005. You do not need to print these documents to answer the questions.

Toll Brothers
America's Luxury Home Builder™

Required:

1. What is Toll Brothers' strategy for success in the marketplace? Does the company rely primarily on a customer intimacy, operational excellence, or product leadership customer value proposition? What evidence supports your conclusion?
2. What business risks does Toll Brothers face that may threaten the company's ability to satisfy stockholder expectations? What are some examples of control activities that the company could use to reduce these risks? (Hint: Focus on pages 10–11 of the 10-K.)
3. Would Toll Brothers be more likely to use process costing or job-order costing? Why?
4. What are some examples of Toll Brothers' direct material costs? Would you expect the bill of materials for each of Toll Brothers' homes to be the same or different? Why?
5. Describe the types of direct labor costs incurred by Toll Brothers. Would Toll Brothers use employee time tickets at their home sites under construction? Why or why not?
6. What are some examples of overhead costs that are incurred by Toll Brothers?
7. Some companies establish prices for their products by marking up their full manufacturing cost (i.e., the sum of direct materials, direct labor, and manufacturing overhead costs). For example, a company may set prices at 150% of each product's full manufacturing cost. Does Toll Brothers price its houses using this approach?
8. How does Toll Brothers assign manufacturing overhead costs to cost objects? From a financial reporting standpoint, why does the company need to assign manufacturing overhead costs to cost objects?

3

Systems Design: Activity-Based Costing

<< A LOOK BACK

Chapter 2 provided an overview of job-order costing. Direct materials and direct labor costs are traced directly to jobs. Manufacturing overhead is applied to jobs using a predetermined overhead rate.

A LOOK AT THIS CHAPTER

In Chapter 3, we continue the discussion of allocation of overhead in job-order costing. Activity-based costing is a technique that uses a number of allocation bases to assign overhead costs to products.

A LOOK AHEAD >>

After comparing job-order and process costing systems, we go into the details of a process costing system in Chapter 4.

CHAPTER OUTLINE

Assigning Overhead Costs to Products

- Plantwide Overhead Rate
- Departmental Overhead Rates
- Activity-Based Costing (ABC)

Designing an Activity-Based Costing System

- Hierarchy of Activities
- An Example of an Activity-Based Costing System Design

Using Activity-Based Costing

- Comtek Sound, Inc.'s Basic Data
- Direct Labor-Hours as a Base
- Computing Activity Rates
- Computing Product Costs
- Shifting of Overhead Cost

Targeting Process Improvements

Evaluation of Activity-Based Costing

- The Benefits of Activity-Based Costing
- Limitations of Activity-Based Costing
- Activity-Based Costing and Service Industries

Cost Flows in an Activity-Based Costing System

- An Example of Cost Flows



DECISION FEATURE

The Payoff from Activity-Based Costing

Implementing an activity-based costing system can be expensive. To be worthwhile, the data supplied by the system must actually be used to make decisions and improve profitability. **Insteel Industries** manufactures a range of products, such as concrete reinforcing steel, industrial wire, and bulk nails, for the construction, home furnishings, appliance, and tire manufacturing industries. The company implemented an activity-based costing system at its manufacturing plant in Andrews, South Carolina, and immediately began using activity-based data to make strategic and operating decisions.

In terms of strategic decisions, Insteel dropped some unprofitable products, raised prices on others, and in some cases even discontinued relationships with unprofitable customers. Insteel realized that simply discontinuing products and customers does not improve profits. The company needed to either deploy its freed-up capacity to increase sales, or it needed to eliminate its freed-up capacity to reduce costs. Insteel chose the former and used its activity-based costing system to identify which new business opportunities to pursue.

In terms of operational improvements, Insteel's activity-based costing system revealed that its 20 most expensive activities consumed 87% of the plant's \$21.4 million in physical and human resource costs. Almost \$4.9 million was being consumed by non-value-added activities. Teams were formed to reduce quality costs, material handling and freight costs, and maintenance costs. Within one year, quality costs had been cut by \$1,800,000 and freight costs by \$550,000. Overall, non-value-added activity costs dropped from 22% to 17% of total activity costs.

Source: V. G. Narayanan and R. Sarkar, "The Impact of Activity-Based Costing on Managerial Decisions at Insteel Industries—A Field Study," *Journal of Economics & Management Strategy*, Summer 2002, pp. 257–288.

LEARNING OBJECTIVES



After studying Chapter 3, you should be able to:

LO1 Understand the basic approach in activity-based costing and how it differs from conventional costing.

LO2 Compute activity rates for an activity-based costing system.

LO3 Compute product costs using activity-based costing.

LO4 Contrast the product costs computed under activity-based costing and conventional costing methods.

LO5 Record the flow of costs in an activity-based costing system.

As discussed in earlier chapters, direct materials and direct labor costs can be directly traced to products. Overhead costs, on the other hand, cannot be easily traced to products. Some other means must be found for assigning them to products for financial reporting and other purposes. In the previous chapter, overhead costs were assigned to products using a plantwide predetermined overhead rate. This method is simpler than the methods of assigning overhead costs to products described in this chapter, but this simplicity has a cost. A plantwide predetermined overhead rate spreads overhead costs uniformly over products in proportion to whatever allocation base is used—most commonly, direct labor-hours. This procedure results in high overhead costs for products with a high direct labor-hour content and low overhead costs for products with a low direct labor-hour content. However, the real causes of overhead may have little to do with direct labor-hours and as a consequence, product costs may be distorted. Activity-based costing attempts to correct these distortions by more accurately assigning overhead costs to products.

ASSIGNING OVERHEAD COSTS TO PRODUCTS

LEARNING OBJECTIVE 1

Understand the basic approach in activity-based costing and how it differs from conventional costing.

Companies use three common approaches to assign overhead costs to products. The simplest method is to use a plantwide overhead rate. A slightly more refined approach is to use departmental overhead rates. The most complex method is activity-based costing, which is the most accurate of the three approaches to overhead cost assignment.

Plantwide Overhead Rate



The preceding chapter assumed that a single overhead rate, called a *plantwide overhead rate*, was used throughout an entire factory. This simple approach to overhead assignment can result in distorted unit product costs, as we shall see below.

When cost systems were developed in the 1800s, cost and activity data had to be collected by hand and all calculations were done with paper and pen. Consequently, the emphasis was on simplicity. Companies often established a single overhead cost pool for an entire facility or department as described in Chapter 2. Direct labor was the obvious choice as an allocation base for overhead costs. Direct labor-hours were already being recorded for purposes of determining wages. In the labor-intensive production processes of that time, direct labor was a large component of product costs—larger than it is today. Moreover, managers believed direct labor and overhead costs were highly correlated. (Two variables, such as direct labor and overhead costs, are highly correlated if they tend to move together.) And finally, most companies produced a very limited variety of similar products, so in fact there was probably little difference in the overhead costs attributable to different products. Under these conditions, it was not cost-effective to use a more elaborate costing system.

Conditions have changed. Many companies now sell a large variety of products that consume significantly different amounts of overhead resources. Consequently, a costing system that assigns essentially the same overhead cost to every product may no longer be adequate. Additionally, factors other than direct labor often drive overhead costs.

On an economywide basis, direct labor and overhead costs have been moving in opposite directions for a long time. As a percentage of total cost, direct labor has been declining, whereas overhead has been increasing. Many tasks previously done by hand are now done with largely automated equipment—a component of overhead. Furthermore, product diversity has increased. Companies are introducing new products and services at an ever-accelerating rate. Managing and sustaining this product diversity requires many more overhead resources such as production schedulers and product design engineers, and many of these overhead resources have no obvious connection with direct labor. Finally, computers, bar code readers, and other technology have dramatically reduced the costs of collecting and processing data—making more complex

(and accurate) costing systems such as activity-based costing much less expensive to build and maintain.

Nevertheless, direct labor remains a viable base for applying overhead to products in some companies—particularly for external reports. Direct labor is an appropriate allocation base for overhead when overhead costs and direct labor are highly correlated. And indeed, most companies throughout the world continue to base overhead allocations on direct labor or machine-hours. However, if factorywide overhead costs do not move in tandem with factorywide direct labor or machine-hours, product costs will be distorted.

Departmental Overhead Rates

Rather than use a plantwide overhead rate, many companies use departmental overhead rates with a different predetermined overhead rate in each production department. The nature of the work performed in a department will determine the department's allocation base. For example, overhead costs in a machining department may be allocated on the basis of machine-hours. In contrast, the overhead costs in an assembly department may be allocated on the basis of direct labor-hours.

Unfortunately, even departmental overhead rates will not correctly assign overhead costs in situations where a company has a range of products and complex overhead costs. The reason is that the departmental approach usually relies on a single measure of activity as the base for allocating overhead cost to products. For example, if the machining department's overhead is applied to products on the basis of machine-hours, it is assumed that the department's overhead costs are caused by, and are directly proportional to, machine-hours. However, the department's overhead costs are probably more complex than this and are caused by a variety of factors, including the range of products processed in the department, the number of batch setups that are required, the complexity of the products, and so on. A more sophisticated method like *activity-based costing* is required to adequately account for these diverse factors.

Activity-Based Costing (ABC)

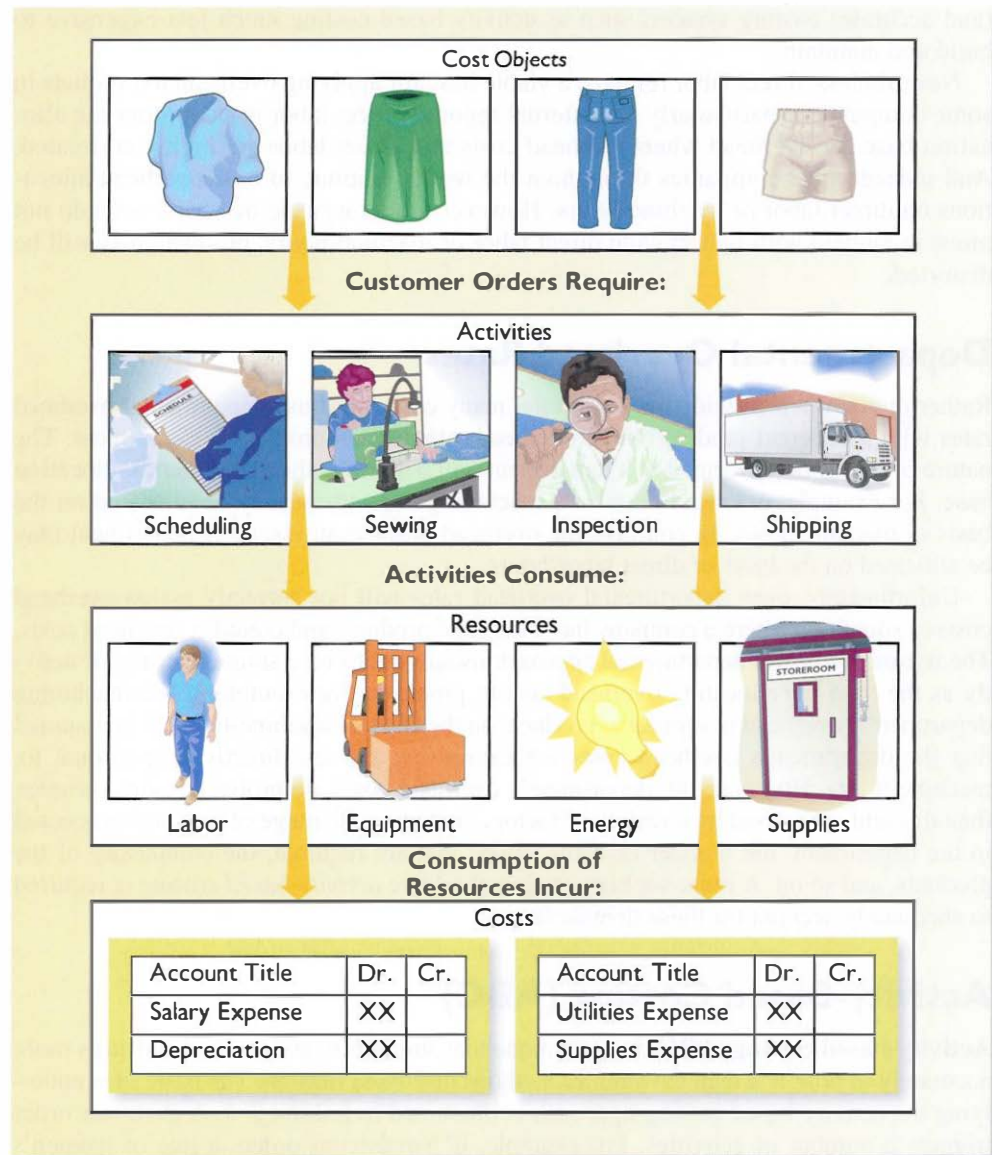
Activity-based costing (ABC) is a technique that attempts to assign overhead costs more accurately to products than the simpler methods discussed thus far. The basic idea underlying the activity-based costing approach is illustrated in Exhibit 3-1. A customer order triggers a number of activities. For example, if **Nordstrom** orders a line of women's skirts from **Calvin Klein**, a production order is generated, patterns are created, materials are ordered, textiles are cut to pattern and then sewn, and the finished products are packed for shipping. These activities consume resources. For example, ordering the appropriate materials consumes clerical time—a resource the company must pay for. In activity-based costing, an attempt is made to trace these costs directly to the products that cause them.

Rather than a single allocation base such as direct labor-hours or machine-hours, in activity-based costing a company uses a number of allocation bases for assigning costs to products. Each allocation base in an activity-based costing system represents a major *activity* that causes overhead costs. An **activity** in activity-based costing is an event that causes the consumption of overhead resources. Examples of activities in various organizations include the following:

- Setting up machines.
- Admitting patients to a hospital.
- Scheduling production.
- Performing blood tests at a clinic.
- Billing customers.
- Maintaining equipment.

EXHIBIT 3-1

The Activity-Based Costing Model



- Ordering materials or supplies.
- Stocking shelves at a store.
- Meeting with clients at a law firm.
- Preparing shipments.
- Inspecting materials for defects.
- Opening an account at a bank.

Activity-based costing focuses on these activities. Each major activity has its own overhead cost pool (also known as an *activity cost pool*), its own *activity measure*, and its own predetermined overhead rate (also known as an *activity rate*). An **activity cost pool** is a “cost bucket” in which costs related to a particular activity measure are accumulated. The **activity measure** expresses how much of the activity is carried out and it is used as the allocation base for applying overhead costs to products and services. For example, *the number of patients admitted* is a natural choice of an activity measure for the activity *admitting patients to the hospital*. An **activity rate** is a predetermined overhead rate in an

activity-based costing system. Each activity has its own activity rate that is used to apply overhead costs to cost objects.

For example, the activity *setting up machines to process a batch* would have its own activity cost pool. Products are ordinarily processed in batches. And because each product has its own machine settings, machines must be set up when changing over from a batch of one product to another. If the total cost in this activity cost pool is \$150,000 and the total expected activity is 1,000 machine setups, the predetermined overhead rate (i.e., activity rate) for this activity would be \$150 per machine setup ($\$150,000 \div 1,000$ machine setups = \$150 per machine setup). Each product that requires a machine setup would be charged \$150. Note that this charge does not depend on how many units are produced after the machine is set up. A small batch requiring a machine setup would be charged \$150—just the same as a large batch.

Taking each activity in isolation, this system works exactly like the job-order costing system described in the last chapter. A predetermined overhead rate is computed for each activity and then applied to jobs and products based on the amount of activity consumed by the job or product.

Shedding Light on Product Profitability

IN BUSINESS

Reichhold, Inc., one of the world's leading suppliers of synthetic materials, has adopted activity-based costing. Reichhold's prior cost system used one allocation base, reactor hours, to assign overhead costs to products. The new ABC system uses four additional activity measures—preprocess preparation hours, thin-tank hours, filtration hours, and waste disposal costs per batch—to assign costs to products. Reichhold has adopted ABC in all 19 of its North American plants because the management team believes that ABC helps improve the company's "capacity management, cycle times, value-added pricing decisions, and analysis of product profitability."

Source: Edward Blocher, Betty Wong, and Christopher McKittrick, "Making Bottom-Up ABC Work at Reichhold, Inc.," *Strategic Finance*, April 2002, pp. 51–55.

DESIGNING AN ACTIVITY-BASED COSTING SYSTEM

The most important decisions in designing an activity-based costing system concern what activities will be included in the system and how the activities will be measured. In most companies, hundreds or even thousands of different activities cause overhead costs. These activities range from taking a telephone order to training new employees. Setting up and maintaining a complex costing system that includes all of these activities would be prohibitively expensive. The challenge in designing an activity-based costing system is to identify a reasonably small number of activities that explain the bulk of the variation in overhead costs. This is usually done by interviewing a broad range of managers in the organization to find out what activities they think are important and that consume most of the resources they manage. This often results in a long list of potential activities that could be included in the activity-based costing system. This list is refined and pruned in consultation with top managers. Related activities are frequently combined to reduce the amount of detail and record-keeping cost. For example, several actions may be involved in handling and moving raw materials, but these may be combined into a single activity titled *material handling*. The end result of this stage of the design process is an *activity dictionary* that defines each of the activities that will be included in the activity-based costing system and how the activities will be measured.

EXHIBIT 3-2

Examples of Activities and Activity Measures in Manufacturing Companies

Level	Activities	Activity Measures
<i>Unit-level</i>	Processing units on machines Processing units by hand Consuming factory supplies	Machine-hours Direct labor-hours Units produced
<i>Batch-level</i>	Processing purchase orders Processing production orders Setting up equipment Handling material	Purchase orders processed Production orders processed Number of setups; setup hours Pounds of material handled; number of times material moved
<i>Product-level</i>	Testing new products Administering parts inventories Designing products	Hours of testing time Number of part types Hours of design time
<i>Facility-level</i>	General factory administration Plant building and grounds	Direct labor-hours* Direct labor-hours*

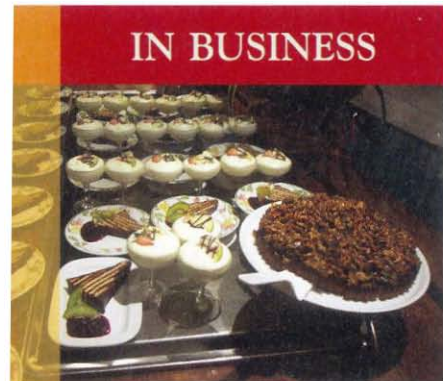
*Facility-level costs cannot be traced on a cause-and-effect basis to individual products. Nevertheless, these costs are usually allocated to products for external reports using some arbitrary allocation basis such as direct labor-hours.

Some of the activities commonly found in activity-based costing systems in manufacturing companies are listed in Exhibit 3–2. In the exhibit, activities have been grouped into a four-level hierarchy: *unit-level activities*, *batch-level activities*, *product-level activities*, and *facility-level activities*. This cost hierarchy is useful in understanding the difference between activity-based costing and conventional approaches. It also serves as a guide when simplifying an activity-based costing system. In general, activities and costs should be combined in the activity-based costing system only if they fall within the same level in the cost hierarchy.

IN BUSINESS**Gastronomic Cost Drivers at the Club Med—Bora Bora**

The Club Med—Bora Bora of Tahiti is a resort owned and operated by the French company **Club Med**. Most guests buy all-inclusive packages that include lodging, participation in the resort's many activities, a full range of beverages, and sumptuous buffet meals. The resort's guests come from around the world including Asia, North America, South America, and Europe. The international nature of the club's guests poses challenges for the kitchen staff—for example, Japanese breakfasts feature miso soup, stewed vegetables in soy sauce, and rice porridge whereas Germans are accustomed to cold cuts, cheese, and bread for breakfast. Moreover, the number of guests varies widely from 300 in the high season to 20 in the low season. The chefs in the kitchen must ensure that food in the correct quantities and variety are available to please the club's varied clientele. To make this possible, a report is prepared each day that lists how many Japanese guests, German guests, French guests, Polish guests, U.S. guests, and so forth, are currently registered. This information helps the chefs prepare the appropriate quantities of specialized foods. In essence, costs in the kitchen are driven not by the number of guests alone, but by how many guests are Japanese, how many German, how many French, and so on. The costs are driven by multiple drivers.

Source: Conversation with Dominique Tredano, Chef de Village (i.e., general manager), Club Med—Bora Bora. For information about Club Med, see www.clubmed.com.



Hierarchy of Activities

Unit-level activities are performed each time a unit is produced. The costs of unit-level activities should be proportional to the number of units produced. For example, providing power to run processing equipment is a unit-level activity because power tends to be consumed in proportion to the number of units produced.

Batch-level activities consist of tasks that are performed each time a batch is processed, such as processing purchase orders, setting up equipment, packing shipments to customers, and handling material. Costs at the batch level depend on *the number of batches processed* rather than on the number of units produced. For example, the cost of processing a purchase order is the same no matter how many units of an item are ordered.

Product-level activities (sometimes called *product-sustaining activities*) relate to specific products and typically must be carried out regardless of how many batches or units of the product are manufactured. Product-level activities include maintaining inventories of parts for a product, issuing engineering change notices to modify a product to meet a customer's specifications, and developing special test routines when a product is first placed into production.

Facility-level activities (also called *organization-sustaining activities*) are activities that are carried out regardless of which products are produced, how many batches are run, or how many units are made. Facility-level costs include items such as factory management salaries, insurance, property taxes, and building depreciation. The costs of facility-level activities must be allocated to products for external financial reports. This is usually accomplished by combining all facility-level costs into a single cost pool and allocating those costs to products using an arbitrary allocation base such as direct labor-hours. However, as we will see later in the book, allocating such costs to products results in misleading data that can lead to bad decisions.

Dining in the Canyon

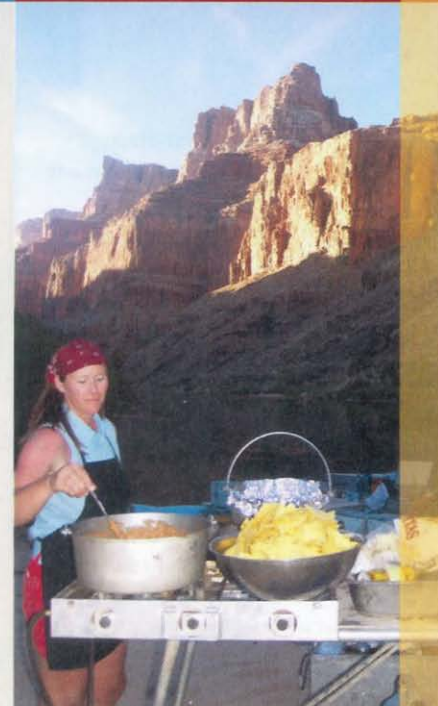
Western River Expeditions (www.westernriver.com) runs river rafting trips on the Colorado, Green, and Salmon rivers. One of its most popular trips is a six-day trip down the Grand Canyon, which features famous rapids such as Crystal and Lava Falls as well as the awesome scenery accessible only from the bottom of the Grand Canyon. The company runs trips of one or two rafts, each of which carries two guides and up to 18 guests. The company provides all meals on the trip, which are prepared by the guides.

In terms of the hierarchy of activities, a guest can be considered as a unit and a raft as a batch. In that context, the wages paid to the guides are a batch-level cost because each raft requires two guides regardless of the number of guests in the raft. Each guest is given a mug to use during the trip and to take home at the end of the trip as a souvenir. The cost of the mug is a unit-level cost because the number of mugs given away is strictly proportional to the number of guests on a trip.

What about the costs of food served to guests and guides—is this a unit-level cost, a batch-level cost, a product-level cost, or an organization-sustaining cost? At first glance, it might be thought that food costs are a unit-level cost—the greater the number of guests, the higher the food costs. However, that is not quite correct. Standard menus have been created for each day of the trip. For example, the first night's menu might consist of shrimp cocktail, steak, cornbread, salad, and cheesecake. The day before a trip begins, all of the food needed for the trip is taken from the central warehouse and packed in modular containers. It isn't practical to finely adjust the amount of food for the actual number of guests planned to be on a trip—most of the food comes prepackaged in large lots. For example, the shrimp cocktail menu may call for two large bags of frozen shrimp per raft and that many bags will be packed regardless of how many guests are expected on the raft. Consequently, the costs of food are not a unit-level cost that varies with the number of guests actually on a trip. Instead, the costs of food are a batch-level cost.

Source: Conversations with Western River Expeditions personnel.

IN BUSINESS

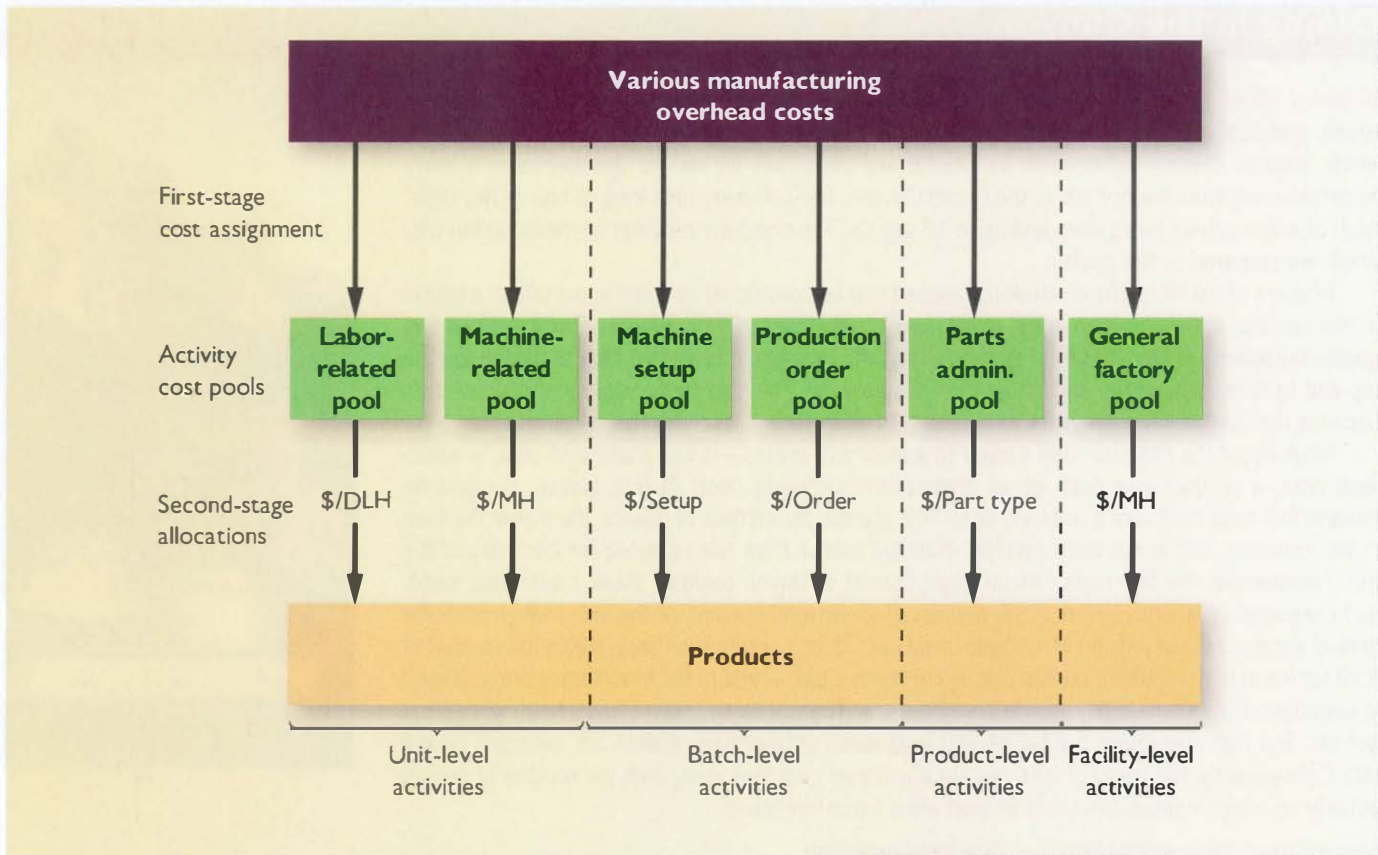


An Example of an Activity-Based Costing System Design

The complexity of an activity-based costing system will differ from company to company. In some companies, the activity-based costing system will be simple with only one or two activity cost pools at the unit, batch, and product levels. For other companies, the activity-based costing system will be much more complex.

Under activity-based costing, the manufacturing overhead costs at the top of Exhibit 3-3 are allocated to products via a two-stage process. In the first stage, overhead costs are assigned to the activity cost pools. In the second stage, the costs in the activity cost pools are allocated to products using activity rates and activity measures. For example, in the first-stage cost assignment, various manufacturing overhead costs are assigned to the production-order activity cost pool. These costs could include the salaries of engineers who modify products for individual orders, the costs of scheduling and monitoring orders, and other costs that are incurred as a consequence of the number of different orders received and processed by the company. We will not go into the details of how these first-stage cost assignments are made. In all of the examples and assignments in this book, the first-stage cost assignments have already been completed. Once the amount of cost in the production-order activity cost pool is known, procedures from Chapter 2 can be followed. The activity rate for the production-order cost pool is computed by dividing the total cost in the production-order activity cost pool by the anticipated number of orders for the upcoming year. For example, the total cost in the production-order activity cost pool might be \$450,000 and the company might expect to process a total of 1,200 orders. In that case, the activity rate would be \$375 per order. Each order would be charged \$375 for production-order costs. This is no different from

EXHIBIT 3-3 Graphic Example of Activity-Based Costing



the way overhead was applied to products in Chapter 2 except that the number of orders is the allocation base rather than direct labor-hours.

1. Which of the following statements is false? (You may select more than one answer.)
 - a. In recent years, most companies have experienced increasing manufacturing overhead costs in relation to direct labor costs.
 - b. Activity-based costing systems may use direct labor-hours and/or machine-hours to assign unit-level costs to products.
 - c. Facility-level costs are not caused by particular products.
 - d. Product-level costs are larger for high-volume products than for low-volume products.



ABC Helps a Dairy Understand Its Costs

Kemps LLC, headquartered in Minneapolis, Minnesota, produces dairy products such as milk, yogurt, and ice cream. The company implemented an ABC system that helped managers understand the impact of product and customer diversity on profit margins. The ABC model “captured differences in how the company entered orders from customers (customer phone call, salesperson call, fax, truck-driver entry, EDI, or Internet), how it packaged orders (full stacks of six cases, individual cases, or partial break-pack cases for small orders), how it delivered orders (commercial carriers or its own fleet, including route miles), and time spent by the driver at each customer location.”

Kemps’ ABC system helped the company acquire a large national customer because it identified “the specific manufacturing, distribution, and order handling costs associated with serving this customer.” The ability to provide the customer with accurate cost information built a trusting relationship that distinguished Kemps from other competitors. Kemps also used its ABC data to transform unprofitable customers into profitable ones. For example, one customer agreed to accept a 13% price increase, to eliminate two low-volume products, and to begin placing full truckload orders rather than requiring partial truckload shipments, thereby lowering Kemps’ costs by \$150,000 per year.

Source: Robert S. Kaplan, and Steven R. Anderson, “Time-Driven Activity-Based Costing,” *Harvard Business Review*, November 2004, pp. 131–139.

IN BUSINESS



USING ACTIVITY-BASED COSTING

Different products place different demands on resources. This is not recognized by conventional costing systems, which assume that overhead resources are consumed in direct proportion to direct labor-hours or machine-hours. The following example illustrates the distortions in product costs that can result from using a traditional costing system.

Comtek Sound, Inc., makes two products, a radio with a built-in CD player (called a CD unit) and a radio with a built-in DVD player (called a DVD unit). Both of these products are sold to automobile manufacturers for installation in new vehicles. Recently, the company has been losing bids to supply CD players because competitors have been bidding less than Comtek Sound has been willing to bid. At the same time, Comtek Sound has been winning every bid it has submitted for its DVD player, which management regards as a secondary product. The marketing manager has been complaining that at the prices Comtek Sound is willing to bid, competitors are taking the company’s high-volume CD business and leaving Comtek Sound with just the low-volume DVD business. However, the prices competitors quote on the CD players are below Comtek Sound’s manufacturing cost for these units—at least according to Comtek Sound’s conventional accounting

system that applies manufacturing overhead to products based on direct labor-hours. Production managers suspected that the conventional costing system might be distorting the relative costs of the CD player and the DVD player—the DVD player takes more overhead resources to make than the CD player and yet their manufacturing overhead costs are identical under the conventional costing system. With the enthusiastic cooperation of the company's accounting department, a cross-functional team was formed to develop an activity-based costing system to more accurately assign overhead costs to the two products.

Comtek Sound, Inc.'s Basic Data

The ABC team gathered basic information relating to the company's two products. A summary of some of this information follows. For the current year, the company's budget provides for selling 50,000 DVD units and 200,000 CD units. Both products require two direct labor-hours to complete. Therefore, the company plans to work 500,000 direct labor-hours (DLHs) during the current year, computed as follows:

DVD units: 50,000 units × 2 DLHs per unit.....	100,000
CD units: 200,000 units × 2 DLHs per unit.....	400,000
Total direct labor-hours.....	<u>500,000</u>

Costs for direct materials and direct labor for one unit of each product are given below:

	DVD Units	CD Units
Direct materials.....	\$90	\$50
Direct labor (at \$10 per DLH)	\$20	\$20

The company's estimated manufacturing overhead costs for the current year total \$10,000,000. The ABC team discovered that although the same amount of direct labor time is required for each product, the more complex DVD units require more machine time, more machine setups, and more testing than the CD units. Also, the team found that it is necessary to manufacture the DVD units in smaller batches; consequently, they require more production orders than the CD units.

The company has always used direct labor-hours as the base for assigning overhead costs to its products.

With these data in hand, the ABC team was prepared to begin the design of the new activity-based costing system. But first, they wanted to compute the cost of each product using the company's existing cost system.

Direct Labor-Hours as a Base

Under the company's existing costing system, the predetermined overhead rate would be \$20 per direct labor-hour, computed as follows:

$$\begin{aligned} \text{Predetermined overhead rate} &= \frac{\text{Estimated total manufacturing overhead}}{\text{Estimated total amount of the allocation base}} \\ &= \frac{\$10,000,000}{500,000 \text{ DLHs}} = \$20 \text{ per DLH} \end{aligned}$$

Using this rate, the ABC team computed the unit product costs as given below:

	DVD Units	CD Units
Direct materials.....	\$ 90	\$ 50
Direct labor.....	20	20
Manufacturing overhead (2 DLHs × \$20 per DLH)	40	40
Unit product cost.....	<u>\$150</u>	<u>\$110</u>

The problem with this costing approach is that it relies entirely on direct labor-hours to assign overhead cost to products and does not consider the impact of other factors—such as setups and testing—on the overhead costs of the company. Even though these other factors suggest that the two products place different demands on overhead resources, under the company’s traditional costing system, the two products are assigned the same overhead cost per unit because they require equal amounts of direct labor time.

While this method of computing costs is fast and simple, it is accurate only in those situations where other factors affecting overhead costs are not significant. These other factors *are* significant in the case of Comtek Sound, Inc.

Computing Activity Rates

The ABC team then analyzed Comtek Sound, Inc.’s operations and identified six major activities to include in the new activity-based costing system. Cost and other data relating to the activities are presented in Exhibit 3–4. That exhibit shows the amount of overhead cost for each activity cost pool, along with the expected amount of activity for the current year. The machine setups activity cost pool, for example, was assigned \$1,600,000 in overhead cost. The company expects to complete 4,000 setups during the year, of which 3,000 will be for DVD units and 1,000 will be for CD units. Data for other activities are also shown in the exhibit.

The ABC team then computed an activity rate for each activity. (See the middle panel in Exhibit 3–4.) The activity rate of \$400 per machine setup, for example, was computed by dividing the total estimated overhead cost in the activity cost pool, \$1,600,000, by the expected amount of activity, 4,000 setups. This process was repeated for each of the other activities in the activity-based costing system.

Computing Product Costs

Once the activity rates were calculated, it was easy to compute the overhead cost that would be allocated to each product. (See the bottom panel of Exhibit 3–4.) For example, the amount of machine setup cost allocated to DVD units was determined by multiplying the activity rate of \$400 per setup by the 3,000 expected setups for DVD units during the year. This yielded a total of \$1,200,000 in machine setup costs to be assigned to the DVD units.

Note from the exhibit that the use of an activity approach has resulted in \$97.80 in overhead cost being assigned to each DVD unit and \$25.55 to each CD unit. The ABC team then used these amounts to determine unit product costs under activity-based costing, as presented in Exhibit 3–5. For comparison, the exhibit also shows the unit product costs derived earlier when direct labor-hours were used as the base for assigning overhead costs to the products.

The ABC team members summarized their findings as follows in the team’s report:

In the past, the company has been charging \$40.00 in overhead cost to a unit of either product, whereas it should have been charging \$97.80 in overhead cost to each DVD

LEARNING OBJECTIVE 2

Compute activity rates for an activity-based costing system.



LEARNING OBJECTIVE 3

Compute product costs using activity-based costing.



EXHIBIT 3-4 Comtek Sound's Activity-Based Costing System

Basic Data				
Activities and Activity Measures	Estimated Overhead Cost	Expected Activity		
		DVD Units	CD Units	Total
Labor related (direct labor-hours)	\$ 800,000	100,000	400,000	500,000
Machine related (machine-hours)	2,100,000	300,000	700,000	1,000,000
Machine setups (setups)	1,600,000	3,000	1,000	4,000
Production orders (orders)	3,150,000	800	400	1,200
Parts administration (part types)	350,000	400	300	700
General factory (machine-hours)	2,000,000	300,000	700,000	1,000,000
	<u>\$10,000,000</u>			

Computation of Activity Rates			
Activities	(a) Estimated Overhead Cost	(b) Total Expected Activity	(a) ÷ (b) Activity Rate
Labor related	\$800,000	500,000 DLHs	\$1.60 per DLH
Machine related	\$2,100,000	1,000,000 MHs	\$2.10 per MH
Machine setups	\$1,600,000	4,000 setups	\$400.00 per setup
Production orders	\$3,150,000	1,200 orders	\$2,625.00 per order
Parts administration	\$350,000	700 part types	\$500.00 per part type
General factory	\$2,000,000	1,000,000 MHs	\$2.00 per MH

Computation of the Overhead Cost per Unit of Product				
Activities and Activity Rates	DVD Units		CD Units	
	Expected Activity	Amount	Expected Activity	Amount
Labor related, at \$1.60 per DLH	100,000	\$ 160,000	400,000	\$ 640,000
Machine related, at \$2.10 per MH	300,000	630,000	700,000	1,470,000
Machine setups, at \$400 per setup	3,000	1,200,000	1,000	400,000
Production orders, at \$2,625 per order	800	2,100,000	400	1,050,000
Parts administration, at \$500 per part type	400	200,000	300	150,000
General factory, at \$2.00 per MH	300,000	600,000	700,000	1,400,000
Total overhead costs assigned (a)		<u>\$4,890,000</u>		<u>\$5,110,000</u>
Number of units produced (b)		50,000		200,000
Overhead cost per unit (a) ÷ (b)		<u>\$97.80</u>		<u>\$25.55</u>

unit and only \$25.55 to each CD unit. Thus, unit costs have been badly distorted as a result of using direct labor-hours as the allocation base. The company may even have been suffering a loss on the DVD units without knowing it because the cost of these units has been so vastly understated. Through activity-based costing, we have been able to more accurately assign overhead costs to each product.

Although in the past we thought our competitors were pricing below their cost on the CD units, it turns out that we were overcharging for these units because our costs were overstated. Similarly, we always used to believe that our competitors were overpricing the DVD units, but now we realize that our prices have been way too low because the cost of our DVD units was being understated. It turns out that we, not our competitors, had everything backwards.

EXHIBIT 3-5
Comparison of Unit Product Costs

	Activity-Based Costing		Direct-Labor-Based Costing	
	DVD Units	CD Units	DVD Units	CD Units
Direct materials.....	\$ 90.00	\$ 50.00	\$ 90.00	\$ 50.00
Direct labor.....	20.00	20.00	20.00	20.00
Manufacturing overhead.....	97.80	25.55	40.00	40.00
Unit product cost.....	<u>\$207.80</u>	<u>\$ 95.55</u>	<u>\$150.00</u>	<u>\$110.00</u>

The pattern of cost distortion shown by the ABC team’s findings is quite common. Such distortion can happen in any company that relies on direct labor-hours or machine-hours in assigning overhead cost to products and ignores other significant causes of overhead costs.

Finding That Golden Top 20%

IN BUSINESS

According to **Meridien Research** of Newton, Massachusetts, 20% of a bank’s customers generate about 150% of its profits. At the other end of the spectrum, 30% of a bank’s customers drain 50% of its profits. The question becomes how do banks identify which customers are in that golden top 20%? For many banks, the answer is revealed through customer relationship management software that provides activity-based costing capability.

“We had some customers that we thought, on the surface, would be very profitable, with an average of \$300,000 in business accounts,” said Jerry Williams, chairman and chief executive officer of **First Bancorp**. “What we didn’t pull out was the fact that some write more than 275 checks a month. Once you apply the labor costs, it’s not a profitable customer.”

Meridien Research estimates that large commercial banks are increasing their spending on customer profitability systems by 14% a year with total annual expenditures exceeding \$6 billion dollars.

Source: Joseph McKendrick, “Your Best Customers May Be Different Tomorrow,” *Bank Technology News*, July 2001, pp. 1–4.

Shifting of Overhead Cost

When a company implements activity-based costing, overhead cost often shifts from high-volume products to low-volume products, with a higher unit product cost resulting for the low-volume products. We saw this happen in the example above, where the product cost of the low-volume DVD units increased from \$150.00 to \$207.80 per unit. This increase in cost resulted from batch-level and product-level costs, which shifted from the high-volume product to the low-volume product. For example, consider the cost of issuing production orders, which is a batch-level activity. As shown in Exhibit 3-4, the average cost to Comtek Sound to issue a single production order is \$2.625. This cost is assigned to a production order regardless of how many units are processed in that order. The key here is to realize that fewer DVD units (the low-volume product) are processed per production order than CD units:

LEARNING OBJECTIVE 4

Contrast the product costs computed under activity-based costing and conventional costing methods.



	DVD Units	CD Units
Number of units produced per year (a).....	50,000	200,000
Number of production orders issued per year (b).....	800	400
Number of units processed per production order (a) ÷ (b)....	62.5	500

Spreading the \$2,625 cost to issue a production order over the number of units processed per order results in the following average cost per unit:

	DVD Units	CD Units
Cost to issue a production order (a)	\$2,625	\$2,625
Average number of units processed per production order (see prior page) (b)	62.5	500
Production order cost per unit (a) ÷ (b)	\$42.00	\$5.25

Thus, the production order cost for a DVD unit (the low-volume product) is \$42, which is *eight times* the \$5.25 cost for a CD unit.

Product-level costs—such as parts administration—have a similar impact. In a conventional costing system, these costs are spread more or less uniformly across all units that are produced. In an activity-based costing system, these costs are assigned more accurately to products. Because product-level costs are fixed with respect to the number of units processed, the average cost per unit of an activity such as parts administration will be higher for low-volume products than for high-volume products.

IN BUSINESS

Process Improvements Help Nurses

Providence Portland Medical Center (PPMC) used ABC to improve one of the most expensive and error-prone processes within its nursing units—ordering, distributing, and administering medications to patients. To the surprise of everyone involved, the ABC data showed that “medication-related activities made up 43% of the nursing unit’s total operating costs.” The ABC team members knew that one of the root causes of this time-consuming process was the illegibility of physician orders that are faxed to the pharmacy. Replacing the standard fax machine with a much better \$5,000 machine virtually eliminated unreadable orders and decreased follow-up telephone calls by more than 90%—saving the hospital \$500,000 per year. In total, the ABC team generated improvement ideas that offered \$1 million of net savings in redeployable resources. “This amount translates to additional time that nurses and pharmacists can spend on direct patient care.”

Source: “How ABC Analysis Will Save PPMC Over \$1 Million a Year,” *Financial Analysis, Planning & Reporting*, November 2003, pp. 6–10.

TARGETING PROCESS IMPROVEMENTS

Activity-based costing can be used to identify activities that would benefit from process improvements. When used in this way, activity-based costing is often called *activity-based management*. Basically, **activity-based management** involves focusing on activities to eliminate waste, decrease processing time, and reduce defects. Activity-based management is used in organizations as diverse as manufacturing companies, hospitals, and the U.S. Marine Corps.

The first step in any improvement program is to decide what to improve. The Theory of Constraints approach discussed in the Prologue is a powerful tool for targeting the area in an organization whose improvement will yield the greatest benefit. Activity-based management provides another approach. The activity rates computed in activity-based costing can provide valuable clues concerning where there is waste and opportunity for improvement. For example, looking at the activity rates in Exhibit 3–4, Comtek’s managers may conclude that \$2.625 to process a production order is far too expensive for an

activity that adds no value to the product. As a consequence, they may target production-order processing for process improvement using Six Sigma as discussed in the Prologue.

Benchmarking is another way to leverage the information in activity rates. **Benchmarking** is a systematic approach to identifying the activities with the greatest room for improvement. It is based on comparing the performance in an organization with the performance of other, similar organizations known for their outstanding performance. If a particular part of the organization performs far below the world-class standard, managers will target that area for improvement.

Comparing Activity-Based and Traditional Product Costs

IN BUSINESS

Airco Heating and Air Conditioning (Airco), located in Van Buren, Arkansas, implemented an ABC system to better understand the profitability of its products. The ABC system assigned \$4,458,605 of overhead costs to eight activities as follows:

Activity Cost Pool	Total Cost	Total Activity	Activity Rate
Machines	\$ 435,425	73,872 machine-hours	\$5.89
Data record maintenance	132,597	14 products administered	\$9,471.21
Material handling	1,560,027	16,872 products	\$92.46
Product changeover	723,338	72 setup hours	\$10,046.36
Scheduling	24,877	2,788 production runs	\$8.92
Raw material receiving	877,107	2,859 receipts	\$306.79
Product shipment	561,014	13,784,015 miles	\$0.04
Customer service	144,220	2,533 customer contacts	\$56.94
Total	<u>\$4,458,605</u>		

Airco's managers were surprised that 55% $[(\$1,560,027 + \$877,107) \div \$4,458,605]$ of its overhead resources were consumed by material handling and receiving activities. They responded by reducing the raw material and part transport distances within the facility. In addition, they compared the traditional and ABC product margin percentages (computed by dividing each product's margin by the sales of the product) for the company's seven product lines of air conditioners as summarized below:

	Product						
	5-ton	6-ton	7.5 ton	10-ton	12.5 ton	15-ton	20-ton
Traditional product margin % ...	-20%	4%	40%	-4%	20%	42%	70%
ABC product margin %.....	-15%	-8%	50%	1%	-6%	40%	69%

In response to the ABC data, Airco decided to explore the possibility of raising prices on 5-ton, 6-ton, and 12.5-ton air conditioners while at the same time seeking to reduce overhead consumption by these products.

Source: Copyright 2004 from "An Application of Activity-Based Costing in the Air Conditioner Manufacturing Industry," *The Engineering Economist*, Volume 49, Issue 3, 2004, pp. 221-236, by Heather Nachtmann and Mohammad Hani Al-Rifai. Reproduced by permission of Taylor & Francis Group, LLC., <http://www.taylorandfrancis.com>.

EVALUATION OF ACTIVITY-BASED COSTING

Activity-based costing improves the accuracy of product costs, helps managers to understand the nature of overhead costs, and helps target areas for improvement through benchmarking and other techniques. These benefits are discussed in this section.

The Benefits of Activity-Based Costing

Activity-based costing improves the accuracy of product costs in three ways. First, activity-based costing usually increases the number of cost pools used to accumulate overhead costs. Rather than accumulating all overhead costs in a single, plantwide pool, or accumulating them in departmental pools, the company accumulates costs for each major activity. Second, the activity cost pools are more homogeneous than departmental cost pools. In principle, all of the costs in an activity cost pool pertain to a single activity. In contrast, departmental cost pools contain the costs of many different activities carried out in the department. Third, activity-based costing uses a variety of activity measures to assign overhead costs to products, some of which are correlated with volume and some of which are not. This differs from conventional approaches that rely exclusively on direct labor-hours or other measures of volume such as machine-hours to assign overhead costs to products.

Because conventional costing systems typically apply overhead costs to products using direct labor-hours, it may appear to managers that overhead costs are caused by direct labor-hours. Activity-based costing makes it clear that batch setups, engineering change orders, and other activities cause overhead costs rather than just direct labor. Managers thus have a better understanding of the causes of overhead costs, which should lead to better decisions and better cost control.

Finally, activity-based costing highlights the activities that could benefit most from Six Sigma and other improvement initiatives. Thus, activity-based costing can be used as a part of programs to improve operations.

IN BUSINESS

Costs in Health Care

Owens & Minor, a \$3 billion medical supplies distributor, offers an activity-based billing option to its customers. Instead of charging a fixed amount for items that are ordered by customers, the charges are based on activities required to fill the order as well as on the cost of the item ordered. For example, Owens & Minor charges extra for weekend deliveries. These charges encourage customers to reduce their weekend delivery requests. This results in decreased costs for Owens & Minor, which can then be passed on to customers in the form of lower charges for the specific items that are ordered. As many as 25% of Owens & Minor's 4,000 health care customers have used this billing option to identify and realize cost reduction opportunities. For example, Bill Wright of **Sutter Health** in Sacramento, California, said that Owens & Minor's activity-based billing has motivated his company to eliminate weekend deliveries, place more items per order, align purchase quantities with prepackaged specifications, and transmit orders electronically. The end result is that one Sutter affiliate decreased its purchasing costs from 4.25% of product costs to 3.75%. In all, Owens & Minor has identified about 250 activity-driven procurement costs that hospitals can manage more efficiently to reduce costs.



Source: Todd Shields, "Hospitals Turning to Activity-Based Costing to Save and Measure Distribution Costs," *Healthcare Purchasing News*, November 2001, pp. 14–15.

Limitations of Activity-Based Costing

Any discussion of activity-based costing is incomplete without some cautionary warnings. First, the cost of implementing and maintaining an activity-based costing system may outweigh the benefits. Second, it would be naïve to assume that product costs provided even by an activity-based costing system are always relevant when making decisions. These limitations are discussed below.

The Cost of Implementing Activity-Based Costing Implementing ABC is a major project that requires substantial resources. First, the cost system must be designed—preferably by a cross-functional team. This requires taking valued employees away from other tasks for a major project. In addition, the data used in the activity-based costing system must be collected and verified. In some cases, this requires collecting data that has never been collected before. In short, implementing and maintaining an activity-based costing system can present a formidable challenge, and management may decide that the costs are too great to justify the expected benefits. Nevertheless, it should be kept in mind that the costs of collecting and processing data have dropped dramatically over the last several decades due to bar coding and other technologies, and these costs can be expected to continue to fall.

When are the benefits of activity-based costing most likely to be worth the cost? Companies that have some of the following characteristics are most likely to benefit from activity-based costing:

1. Products differ substantially in volume, batch size, and in the activities they require.
2. Conditions have changed substantially since the existing cost system was established.
3. Overhead costs are high and increasing and no one seems to understand why.
4. Management does not trust the existing cost system and ignores cost data from the system when making decisions.

Limitations of the ABC Model The activity-based costing model relies on a number of critical assumptions.¹ Perhaps the most important of these assumptions is that the cost in each activity cost pool is strictly proportional to its activity measure. What little evidence we have on this issue suggests that overhead costs are less than proportional to activity.² Economists call this increasing returns to scale—as activity increases, the average cost drops. As a practical matter, this means that product costs computed by a traditional or activity-based costing system will be overstated for the purposes of making decisions. The product costs generated by activity-based costing are almost certainly more accurate than those generated by a conventional costing system, but they should nevertheless be viewed with caution. Managers should be particularly alert to product costs that contain allocations of facility-level costs. As we shall see later in the book, product costs that include facility-level or organization-sustaining costs can easily lead managers astray.

Modifying the ABC Model The discussion in this chapter has assumed that the primary purpose of an activity-based costing system is to provide more accurate product costs for external reports. If the product costs are to be used by managers for internal decisions, some modifications should be made. For example, for decision-making purposes, the distinction between manufacturing costs on the one hand and selling and

¹Eric Noreen, “Conditions under Which Activity-Based Cost Systems Provide Relevant Costs,” *Journal of Management Accounting Research*, Fall 1991, pp. 159–168.

²Eric Noreen and Naomi Soderstrom, “The Accuracy of Proportional Cost Models: Evidence from Hospital Service Departments,” *Review of Accounting Studies* 2, 1997; and Eric Noreen and Naomi Soderstrom, “Are Overhead Costs Proportional to Activity? Evidence from Hospital Service Departments,” *Journal of Accounting and Economics*, January 1994, pp. 253–278.

YOU DECIDE

Bakery Owner

You are the owner of a bakery that makes a complete line of specialty breads, pastries, cakes, and pies for the retail and wholesale markets. A summer intern has just completed an activity-based costing study that concluded, among other things, that one of your largest recurring jobs is losing money. A local luxury hotel orders the same assortment of desserts every week for its Sunday brunch buffet for a fixed price of \$975 per week. The hotel is quite happy with the quality of the desserts the bakery has been providing, but it would seek bids from other local bakeries if the price were increased.

The activity-based costing study conducted by the intern revealed that the cost to the bakery of providing these desserts is \$1,034 per week, resulting in an apparent loss of \$59 per week or over \$3,000 per year. Scrutinizing the intern's report, you find that the weekly cost of \$1,034 includes facility-level costs of \$329. These facility-level costs include portions of the rent on the bakery's building, your salary, depreciation on the office personal computer, and so on. The facility-level costs were arbitrarily allocated to the Sunday brunch job on the basis of direct labor-hours.

Should you demand an increase in price from the luxury hotel for the Sunday brunch desserts to at least \$1,034? If an increase is not forthcoming, should you withdraw from the agreement and discontinue providing the desserts?

administrative expenses on the other hand is unimportant. Managers need to know what costs a product causes, and it doesn't matter whether the costs are manufacturing costs or selling and administrative expenses. Consequently, for decision-making purposes, some selling and administrative expenses should be assigned to products as well as manufacturing costs. Moreover, as mentioned above, facility-level and organization-sustaining costs should be removed from product costs when making decisions. Nevertheless, the techniques covered in this chapter provide a good basis for understanding the mechanics of activity-based costing. For a more complete coverage of the use of activity-based costing in decisions, see more advanced texts.³

Activity-Based Costing and Service Industries

Although initially developed as a tool for manufacturing companies, activity-based costing is also being used in service industries. Successful implementation of an activity-based costing system depends on identifying the key activities that generate costs and tracking how many of those activities are performed for each service the organization provides. Activity-based costing has been implemented in a wide variety of service industries including railroads, hospitals, banks, and data services companies.

DECISION MAKER

Legal Firm Business Manager

You have been hired to manage the business aspects of a local legal firm with a staff of 6 attorneys, 10 paralegals, and 5 staffpersons. Clients of the firm are billed a fixed amount per hour of attorney time. The fixed hourly charge is determined each year by dividing the total cost of the legal office for the preceding year by the total billed hours of attorney time for that year. A markup of 25% is then added to this average cost per hour of billed attorney time to provide for a profit and for inflation.

The firm's partners are concerned because the firm has been unprofitable for several years. The firm has been losing its smaller clients to other local firms—largely because the firm's fees have become uncompetitive. And the firm has been attracting larger clients with more complex legal problems from its competitors. To serve these demanding larger clients, the firm must subscribe

³See, for example, Chapter 8 and its appendix in Ray Garrison, Eric Noreen, and Peter Brewer, *Managerial Accounting*, 13th edition, McGraw-Hill/Irwin © 2010.

DECISION MAKER

(continued)

to expensive online legal reference services, hire additional paralegals and staffpersons, and lease additional office space.

What do you think might be the reason for the unprofitable operations in recent years? What might be done to improve the situation for the coming year?

2. Which of the following statements is false? (You may select more than one answer.)
 - a. Activity-based costing systems usually shift costs from low-volume products to high-volume products.
 - b. Benchmarking can be used to identify activities with the greatest potential for improvement.
 - c. Activity-based costing is most valuable to companies that manufacture products that are similar in terms of their volume of production, batch size, and complexity.
 - d. Activity-based costing systems are based on the assumption that the costs included in each activity cost pool are strictly proportional to the cost pool's activity measure.



COST FLOWS IN AN ACTIVITY-BASED COSTING SYSTEM

In Chapter 2, we discussed the flow of costs in a job-order costing system. The flow of costs through Raw Materials, Work in Process, and other accounts is the same under activity-based costing. The only difference in activity-based costing is that more than one predetermined overhead rate is used to apply overhead costs to products. In this section we provide a detailed example of cost flows in an activity-based costing system.

LEARNING OBJECTIVE 5

Record the flow of costs in an activity-based costing system.

An Example of Cost Flows

The company in the following example has five activity cost pools and therefore must compute five predetermined overhead rates (i.e., activity rates). Except for that detail, the journal entries, T-accounts, and general cost flows are the same as described in Chapter 2.



Basic Data Sarvik Company uses activity-based costing for its external financial reports. The company has five activity cost pools, which are listed below along with relevant data for the coming year.

Activity Cost Pool	Activity Measure	Estimated Overhead Cost	Expected Activity
Machine related	Machine-hours	\$175,000	5,000 MHs
Purchase orders.....	Number of orders	\$63,000	700 orders
Machine setups.....	Number of setups	\$92,000	460 setups
Product testing.....	Number of tests	\$160,000	200 tests
General factory	Direct labor-hours	\$300,000	25,000 DLHs

At the beginning of the year, the company had inventory balances as follows:

Raw materials.....	\$3,000
Work in process.....	\$4,000
Finished goods	\$0

Selected transactions recorded by the company during the year are given below:

- a. Raw materials were purchased on account, \$915,000.
- b. Raw materials were requisitioned for use in production, \$900,000 (\$810,000 direct and \$90,000 indirect).
- c. Labor costs were incurred in the factory, \$370,000 (\$95,000 direct labor and \$275,000 indirect labor).
- d. Depreciation was recorded on factory assets, \$180,000.
- e. Miscellaneous manufacturing overhead costs were incurred, \$230,000.
- f. Manufacturing overhead cost was applied to production. Actual activity during the year was as follows:

Activity Cost Pool	Actual Activity
Machine related	4,600 MHs
Purchase orders	800 orders
Machine setups	500 setups
Product testing	190 tests
General factory	23,000 DLHs

- g. Goods costing \$1,650,000 to manufacture according to the activity-based costing system were completed during the year.

Tracking the Flow of Costs The predetermined overhead rates (i.e., activity rates) for the activity cost pools would be computed as follows:

Activity Cost Pools	(a) Estimated Overhead Cost	(b) Total Expected Activity	(a) ÷ (b) Activity Rate
Machine related	\$175,000	5,000 machine-hours	\$35 per machine-hour
Purchase orders	\$63,000	700 orders	\$90 per order
Machine setups	\$92,000	460 setups	\$200 per setup
Product testing	\$160,000	200 tests	\$800 per test
General factory	\$300,000	25,000 direct labor-hours	\$12 per direct labor-hour

The following journal entries would be used to record transactions (a) through (g) above:

a.	Raw Materials	915,000	
	Accounts Payable*		915,000
b.	Work in Process	810,000	
	Manufacturing Overhead	90,000	
	Raw Materials		900,000
c.	Work in Process	95,000	
	Manufacturing Overhead	275,000	
	Salaries and Wages Payable*		370,000
d.	Manufacturing Overhead	180,000	
	Accumulated Depreciation		180,000
e.	Manufacturing Overhead	230,000	
	Accounts Payable*		230,000

*Other accounts, such as Cash, may be credited.

From Chapter 2 the formula for computing applied overhead cost is:

$$\text{Applied overhead cost} = \text{Predetermined overhead rate} \times \text{Actual activity}$$

In activity-based costing, this formula is applied for each activity cost pool using its own predetermined overhead rate (i.e., activity rate). The computations are as follows:

Activities	(1) Activity Rate	(2) Actual Activity	(1) × (2) Applied Overhead Cost
Machine related	\$35 per MH	4,600 MHs	\$161,000
Purchase orders.....	\$90 per order	800 orders	72,000
Machine setups.....	\$200 per setup	500 setups	100,000
Product testing.....	\$800 per test	190 tests	152,000
General factory	\$12 per DLH	23,000 DLHs	276,000
Total.....			<u>\$761,000</u>

By totaling these five applied overhead cost figures, we find that the company applied \$761,000 in overhead cost to products during the year. The following entry would be used to record this application of overhead cost:

f.	Work in Process	761,000	
	Manufacturing Overhead		761,000

Finally, the following journal entry would be used to record the completion of work in process as described in transaction (g) above:

g.	Finished Goods	1,650,000	
	Work in Process		1,650,000

The T-accounts corresponding to the above journal entries appear below:

Raw Materials		Work in Process		Finished Goods	
Bal. 3,000	(b) 900,000	Bal. 4,000	(g) 1,650,000	Bal. 0	
(a) 915,000		(b) 810,000		(g) 1,650,000	
Bal. 18,000		(c) 95,000			
		(f) 761,000			
		Bal. 20,000			

Accumulated Depreciation		Accounts Payable		Salaries and Wages Payable	
	(d) 180,000		(a) 915,000		(c) 370,000
			(e) 230,000		

Manufacturing Overhead	
(b) 90,000	(f) 761,000
(c) 275,000	
(d) 180,000	
(e) 230,000	
775,000	761,000
Bal. 14,000	

The overhead is underapplied by \$14,000. This can be determined directly, as shown below, or by reference to the balance in the Manufacturing Overhead T-account on the prior page.

Actual manufacturing overhead incurred	\$775,000
Manufacturing overhead applied	761,000
Overhead underapplied	<u>\$ 14,000</u>

SUMMARY

LO1 Understand the basic approach in activity-based costing and how it differs from conventional costing.

Activity-based costing was developed to more accurately assign overhead costs to products. Activity-based costing differs from conventional costing as described in Chapter 2 in two major ways. First, in activity-based costing, each major activity that consumes overhead resources has its own cost pool and its own activity rate, whereas in Chapter 2 there was only a single overhead cost pool and a single predetermined overhead rate. Second, the allocation bases (or activity measures) in activity-based costing are diverse. They may include machine setups, purchase orders, engineering change orders, and so on, in addition to direct labor-hours or machine-hours. Nevertheless, within each activity cost pool, the mechanics of computing overhead rates and of applying overhead to products are the same as described in Chapter 2. However, the increase in the number of cost pools and the use of better activity measures generally result in more accurate product costs.

LO2 Compute activity rates for an activity-based costing system.

Each activity in an activity-based costing system has its own cost pool and its own activity measure. The activity rate for a particular activity is computed by dividing the total cost in the activity's cost pool by the total amount of activity.

LO3 Compute product costs using activity-based costing.

Product costs in activity-based costing, as in conventional costing systems, consist of direct materials, direct labor, and overhead. In both systems, overhead is applied to products using predetermined overhead rates. In the case of an activity-based costing system, each activity has its own predetermined overhead rate (i.e., activity rate). The activities required by a product are multiplied by their respective activity rates to determine the amount of overhead that is applied to the product.

LO4 Contrast the product costs computed under activity-based costing and conventional costing methods.

Under conventional costing methods, overhead costs are applied to products using some measure of volume such as direct labor-hours or machine-hours. This results in most of the overhead cost being applied to high-volume products. In contrast, under activity-based costing, some overhead costs are applied on the basis of batch-level or product-level activities. This change in allocation bases shifts overhead costs from high-volume products to low-volume products. Accordingly, product costs for high-volume products are commonly lower under activity-based costing than under conventional costing methods, and product costs for low-volume products are higher.

LO5 Record the flow of costs in an activity-based costing system.

The journal entries and general flow of costs in an activity-based costing system are the same as they are in a conventional costing system. The only difference is the use of more than one predetermined overhead rate (i.e., activity rate) to apply overhead to products.

GUIDANCE ANSWERS TO DECISION MAKER AND YOU DECIDE

Bakery Owner (p. 142)

The bakery really isn't losing money on the weekly order of desserts from the luxury hotel. By definition, facility-level costs are not affected by individual products and jobs—these costs would continue unchanged even if the weekly order were dropped. Recalling the discussion in Chapter 1 concerning decision making, only those costs and benefits that differ between alternatives in a decision are relevant. Because the facility-level costs would be the same whether the dessert order is kept or dropped, they are not relevant in this decision and should be ignored. Hence, the real cost of the job is \$705 (\$1,034 – \$329), which reveals that the job actually yields a weekly profit of \$270 (\$975 – \$705) rather than a loss.

No, the bakery owner should not press for a price increase—particularly if that would result in the hotel seeking bids from competitors. And no, the bakery owner certainly should not withdraw from the agreement to provide the desserts.

Legal Firm Business Manager (p. 142)

The recent problems the firm has been facing can probably be traced to its simplified billing system. Rather than carefully tracing costs to clients, costs are arbitrarily allocated to clients on the basis of attorney hours. Large, demanding clients require much more overhead resources than smaller clients, but the costs of these overhead resources are arbitrarily allocated to all clients on the basis of attorney hours. This results in shifting overhead costs to the smaller, less demanding clients and increasing their charges. It also results in undercharging larger, more demanding clients. Consequently, the firm has been losing smaller clients to competitors and has been attracting larger, demanding clients. Unfortunately, this change in the mix of clients has led to much higher costs and reduced profits.

The situation can be improved by using activity-based costing to trace more costs directly to clients. This should result in shifting costs from the smaller, less demanding clients to the larger, more demanding clients that cause those costs. Smaller clients will face lower charges and hence will be more likely to stay with the firm. Larger, more demanding clients will face higher charges that will fully cover the costs they impose on the firm.

GUIDANCE ANSWERS TO CONCEPT CHECKS

1. **Choice d.** Product-level costs are unrelated to the amount of a product that is made.
2. **Choices a and c.** Activity-based costing systems usually shift costs from high-volume products to low-volume products. Activity-based costing is most valuable for companies with highly diverse products rather than with similar products.



REVIEW PROBLEM: ACTIVITY-BASED COSTING

Aerodcc, Inc., manufactures and sells two types of wooden deck chairs: Deluxe and Tourist. Annual sales in units, direct labor-hours (DLHs) per unit, and total direct labor-hours per year are provided below:

Deluxe deck chair: 2,000 units × 5 DLHs per unit.....	10,000
Tourist deck chair: 10,000 units × 4 DLHs per unit.....	40,000
Total direct labor-hours.....	<u>50,000</u>

Costs for direct materials and direct labor for one unit of each product are given below:

	Deluxe	Tourist
Direct materials.....	\$25	\$17
Direct labor (at \$12 per DLH).....	\$60	\$48

Manufacturing overhead costs total \$800,000 each year. The breakdown of these costs among the company's six activity cost pools is given below. The activity measures are shown in parentheses.

Activities and Activity Measures	Estimated Overhead Cost	Expected Activity		
		Deluxe	Tourist	Total
Labor related (direct labor-hours)	\$ 80,000	10,000	40,000	50,000
Machine setups (number of setups).....	150,000	3,000	2,000	5,000
Parts administration (number of parts).....	160,000	50	30	80
Production orders (number of orders).....	70,000	100	300	400
Material receipts (number of receipts)	90,000	150	600	750
General factory (machine-hours)	250,000	12,000	28,000	40,000
	<u>\$800,000</u>			

Required:

- Classify each of Aerodcc's activities as either a unit-level, batch-level, product-level, or facility-level activity.
- Assume that the company applies overhead cost to products on the basis of direct labor-hours.
 - Compute the predetermined overhead rate.
 - Determine the unit product cost of each product, using the predetermined overhead rate computed in (2)(a) above.
- Assume that the company uses activity-based costing to compute overhead rates.
 - Compute the activity rate (i.e., predetermined overhead rate) for each of the six activities listed above.
 - Using the rates developed in (3)(a) above, determine the amount of overhead cost that would be assigned to a unit of each product.
 - Determine the unit product cost of each product and compare this cost to the cost computed in (2)(b) above.

Solution to Review Problem

1.

Activity Cost Pool	Type of Activity
Labor related.....	Unit-level
Machine setups.....	Batch-level
Parts administration	Product-level
Production orders.....	Batch-level
Material receipts.....	Batch-level
General factory	Facility-level

$$\begin{aligned}
 2. \quad a. \quad \text{Predetermined overhead rate} &= \frac{\text{Estimated total manufacturing overhead}}{\text{Estimated total amount of the allocation base}} \\
 &= \frac{\$800,000}{50,000 \text{ DLHs}} = \$16 \text{ per DLH}
 \end{aligned}$$

b.

	Deluxe	Tourist
Direct materials	\$ 25	\$ 17
Direct labor.....	60	48
Manufacturing overhead applied:		
Deluxe: 5 DLHs × \$16 per DLH.....	80	
Tourist: 4 DLHs × \$16 per DLH		64
Unit product cost	<u>\$165</u>	<u>\$129</u>

3. a.

Activities	(a) Estimated Overhead Cost	(b) Total Expected Activity	(a) ÷ (b) Activity Rate
Labor related	\$80,000	50,000 DLHs	\$1.60 per DLH
Machine setups	\$150,000	5,000 setups	\$30.00 per setup
Parts administration	\$160,000	80 parts	\$2,000.00 per part
Production orders	\$70,000	400 orders	\$175.00 per order
Material receipts	\$90,000	750 receipts	\$120.00 per receipt
General factory	\$250,000	40,000 MHs	\$6.25 per MH

b.

Activities and Activity Rates	Deluxe		Tourist	
	Expected Activity	Amount	Expected Activity	Amount
Labor related, at \$1.60 per DLH	10,000	\$ 16,000	40,000	\$ 64,000
Machine setups, at \$30 per setup	3,000	90,000	2,000	60,000
Parts administration, at \$2,000 per part	50	100,000	30	60,000
Production orders, at \$175 per order	100	17,500	300	52,500
Material receipts, at \$120 per receipt	150	18,000	600	72,000
General factory, at \$6.25 per MH	12,000	75,000	28,000	175,000
Total overhead cost assigned (a)		<u>\$316,500</u>		<u>\$483,500</u>
Number of units produced (b)		2,000		10,000
Overhead cost per unit, (a) ÷ (b)		\$158.25		\$48.35

c.

	Deluxe	Tourist
Direct materials	\$ 25.00	\$ 17.00
Direct labor	60.00	48.00
Manufacturing overhead (see above)	158.25	48.35
Unit product cost	<u>\$243.25</u>	<u>\$113.35</u>

Under activity-based costing, the unit product cost of the Deluxe deck chair is much greater than the cost computed in (2)(b) above, and the unit product cost of the Tourist deck chair is much less. Using volume (direct labor-hours) in (2)(b) to apply overhead cost to products results in too little overhead cost being applied to the Deluxe deck chair (the low-volume product) and too much overhead cost being applied to the Tourist deck chair (the high-volume product).

GLOSSARY

Activity An event that causes the consumption of overhead resources. (p. 127)

Activity-based costing (ABC) A two-stage costing method in which overhead costs are applied to products on the basis of the activities they require. (p. 127)

Activity-based management A management approach that focuses on managing activities as a way of eliminating waste and reducing delays and defects. (p. 138)

- Activity cost pool** A “bucket” in which costs are accumulated that relate to a single activity measure in an activity-based costing system. (p. 128)
- Activity measure** An allocation base in an activity-based costing system; ideally, a measure of whatever causes the costs in an activity cost pool. (p. 128)
- Activity rate** A predetermined overhead rate in activity-based costing. Each activity cost pool has its own activity rate which is used to apply overhead to products and services. (p. 128)
- Batch-level activities** Activities that are performed each time a batch of goods is handled or processed, regardless of how many units are in a batch. The amount of resources consumed depends on the number of batches run rather than on the number of units in the batch. (p. 131)
- Benchmarking** A systematic approach to identifying the activities with the greatest room for improvement. It is based on comparing the performance in an organization with the performance of other, similar organizations known for their outstanding performance. (p. 139)
- Facility-level activities** Activities that are carried out regardless of which products are produced, how many batches are run, or how many units are made. (p. 131)
- Product-level activities** Activities that relate to specific products that must be carried out regardless of how many units are produced and sold or batches run. (p. 131)
- Unit-level activities** Activities that arise as a result of the total volume of goods and services that are produced, and that are performed each time a unit is produced. (p. 131)

QUESTIONS

- 3-1 What are the three common approaches for assigning overhead costs to products?
- 3-2 Why is activity-based costing growing in popularity?
- 3-3 Why do departmental overhead rates sometimes result in inaccurate product costs?
- 3-4 What are the four hierarchical levels of activity discussed in the chapter?
- 3-5 Why is activity-based costing described as a “two-stage” costing method?
- 3-6 Why do overhead costs often shift from high-volume products to low-volume products when a company switches from a conventional costing method to activity-based costing?
- 3-7 What are the three major ways in which activity-based costing improves the accuracy of product costs?
- 3-8 What are the major limitations of activity-based costing?



Multiple-choice questions are provided on the text website at www.mhhe.com/brewer5e.

BRIEF EXERCISES



BRIEF EXERCISE 3-1 ABC Cost Hierarchy [LO1]

The following activities occur at Greenwich Corporation, a company that manufactures a variety of products.

- Receive raw materials from suppliers.
- Manage parts inventories.
- Do rough milling work on products.
- Interview and process new employees in the personnel department.
- Design new products.
- Perform periodic preventive maintenance on general-use equipment.
- Use the general factory building.
- Issue purchase orders for a job.

Required:

Classify each of the activities above as either a unit-level, batch-level, product-level, or facility-level activity.

BRIEF EXERCISE 3-2 Compute Activity Rates [LO2]

Kramer Corporation is a diversified manufacturer of consumer goods. The company’s activity-based costing system has the following seven activity cost pools:

Activity Cost Pool	Estimated Overhead Cost	Expected Activity
Labor related.....	\$48,000	20,000 direct labor-hours
Machine related.....	\$67,500	45,000 machine-hours
Machine setups.....	\$84,000	600 setups
Production orders.....	\$112,000	400 orders
Product testing.....	\$58,500	900 tests
Packaging.....	\$90,000	6,000 packages
General factory.....	\$672,000	20,000 direct labor-hours

Required:

1. Compute the activity rate for each activity cost pool.
2. Compute the company's predetermined overhead rate, assuming that the company uses a single plantwide predetermined overhead rate based on direct labor-hours.

BRIEF EXERCISE 3-3 Compute ABC Product Costs [LO3]

Klumper Corporation is a diversified manufacturer of industrial goods. The company's activity-based costing system contains the following six activity cost pools and activity rates:

Activity Cost Pool	Activity Rates
Labor related.....	\$6.00 per direct labor-hour
Machine related.....	\$4.00 per machine-hour
Machine setups.....	\$50.00 per setup
Production orders.....	\$90.00 per order
Shipments.....	\$14.00 per shipment
General factory.....	\$9.00 per direct labor-hour

Cost and activity data have been supplied for the following products:

	K425	M67
Direct materials cost per unit.....	\$13.00	\$56.00
Direct labor cost per unit.....	\$5.60	\$3.50
Number of units produced per year.....	200	2,000

	Total Expected Activity	
	K425	M67
Direct labor-hours.....	80	500
Machine-hours.....	100	1,500
Machine setups.....	1	4
Production orders.....	1	4
Shipments.....	1	10

Required:

Compute the unit product cost of each product listed above.


BRIEF EXERCISE 3-4 Contrast ABC and Conventional Product Costs [LO4]

Midwest Industrial Products Corporation makes two products, Product H and Product L. Product H is expected to sell 50,000 units next year and Product L is expected to sell 10,000 units. A unit of either product requires 0.2 direct labor-hours.

The company's total manufacturing overhead for the year is expected to be \$1,920,000.

Required:

- The company currently applies manufacturing overhead to products using direct labor-hours as the allocation base. If this method is followed, how much overhead cost would be applied to each product? Compute both the overhead cost per unit and the total amount of overhead cost that would be applied to each product. (In other words, how much overhead cost is applied to a unit of Product H? Product L? How much overhead cost is applied in total to all the units of Product H? Product L?)
- Management is considering an activity-based costing system and would like to know what impact this change might have on product costs. For purposes of discussion, it has been suggested that all of the manufacturing overhead be treated as a product-level cost. The total manufacturing overhead would be divided in half between the two products, with \$960,000 assigned to Product H and \$960,000 assigned to Product L.
If this suggestion is followed, how much overhead cost per unit would be applied to each product?
- Explain the impact on unit product costs of the switch in costing systems.

BRIEF EXERCISE 3-5 Cost Flows in an ABC System [LO5]

Larker Corporation implemented activity-based costing several years ago and uses it for its external financial reports. The company has four activity cost pools, which are listed below.

Activity Cost Pool	Activity Rate
Machine related	\$24 per MH
Purchase orders	\$85 per order
Machine setups	\$175 per setup
General factory	\$16 per DLH

At the beginning of the year, the company had inventory balances as follows:

Raw materials	\$18,000
Work in process	\$24,000
Finished goods	\$46,000

Selected transactions recorded by the company during the year are given below:

- Raw materials were purchased on account, \$854,000.
- Raw materials were requisitioned for use in production, \$848,000 (\$780,000 direct and \$68,000 indirect).
- Labor costs were incurred in the factory, \$385,000 (\$330,000 direct labor and \$55,000 indirect labor).
- Depreciation was recorded on factory assets, \$225,000.
- Miscellaneous manufacturing overhead costs were incurred, \$194,000.
- Manufacturing overhead cost was applied to production. Actual activity during the year was as follows:

Activity Cost Pool	Actual Activity
Machine related	3,800 MHs
Purchase orders	700 orders
Machine setups	400 setups
General factory	22,000 DLHs

- Completed products were transferred to the company's finished goods warehouse. According to the company's costing system, these products cost \$1,690,000.

Required:

1. Prepare journal entries to record transactions (a) through (g) on the prior page.
2. Post the entries in part (1) above to T-accounts.
3. Compute the underapplied or overapplied overhead cost in the Manufacturing Overhead account.

connect

EXERCISES**EXERCISE 3-6 Cost Flows in Activity-Based Costing [LO2, LO5]**

Sylvan Company uses activity-based costing to determine product costs for external financial reports. The company's partially completed Manufacturing Overhead T-account for the current year is shown below:



Manufacturing Overhead	
(a)	1,302,000

Required:

1. What does the entry (a) above represent?
2. At the beginning of the year, the company made the following estimates of cost and activity for its five activity cost pools:

Activity Cost Pool	Activity Measure	Estimated Overhead Cost	Expected Activity
Labor related.....	Direct labor-hours	\$280,000	40,000 DLHs
Purchase orders.....	Number of orders	\$90,000	1,500 orders
Parts management.....	Number of part types	\$120,000	400 part types
Board etching.....	Number of boards	\$360,000	2,000 boards
General factory.....	Machine-hours	\$400,000	80,000 MHs

Compute the activity rate (i.e., predetermined overhead rate) for each of the activity cost pools.

3. During the year, actual activity was recorded as follows:

Activity Cost Pool	Actual Activity
Labor related.....	41,000 DLHs
Purchase orders.....	1,300 orders
Parts management.....	420 part types
Board etching.....	2,150 boards
General factory.....	82,000 MHs

Determine the amount of manufacturing overhead cost applied to production for the year.

4. Determine the amount of underapplied or overapplied overhead cost for the year.

EXERCISE 3-7 Assigning Overhead to Products in ABC [LO3]

Refer to the data in Exercise 3-6 for Sylvan Company. Activities during the year were distributed across the company's four products as follows:

Activity Cost Pool	Actual Activity			
	Product A	Product B	Product C	Product D
Labor related (DLHs).....	8,000	12,000	15,000	6,000
Purchase orders (orders).....	100	300	400	500
Parts management (part types).....	20	90	200	110
Board etching (boards).....	0	1,500	650	0
General factory (MHs).....	16,000	24,000	30,000	12,000

Required:

Compute the amount of overhead cost applied to each product during the year.

EXERCISE 3-8 Computing ABC Product Costs [LO2, LO3]

Fogerty Company makes two products, titanium Hubs and Sprockets. Data regarding the two products follow:

	Direct Labor-Hours per Unit	Annual Production
Hubs.....	0.80	10,000 units
Sprockets.....	0.40	40,000 units

Additional information about the company follows:

- Hubs require \$32 in direct materials per unit, and Sprockets require \$18.
- The direct labor wage rate is \$15 per hour.
- Hubs are more complex to manufacture than Sprockets and they require special equipment.
- The ABC system has the following activity cost pools:

Activity Cost Pool	Activity Measure	Estimated Overhead Cost	Activity		
			Hubs	Sprockets	Total
Machine setups	Number of setups	\$72,000	100	300	400
Special processing	Machine-hours	\$200,000	5,000	0	5,000
General factory	Direct labor-hours	\$816,000	8,000	16,000	24,000

Required:

- Compute the activity rate (i.e., predetermined overhead rate) for each activity cost pool.
- Determine the unit product cost of each product according to the ABC system.



EXERCISE 3-9 Contrast ABC and Conventional Product Costs [LO2, LO3, LO4]

Harrison Company makes two products and uses a conventional costing system in which a single plant-wide predetermined overhead rate is computed based on direct labor-hours. Data for the two products for the upcoming year follow:

	Rascon	Parcel
Direct materials cost per unit	\$13.00	\$22.00
Direct labor cost per unit	\$6.00	\$3.00
Direct labor-hours per unit	0.40	0.20
Number of units produced	20,000	80,000

These products are customized to some degree for specific customers.

Required:

- The company's manufacturing overhead costs for the year are expected to be \$576,000. Using the company's conventional costing system, compute the unit product costs for the two products.
- Management is considering an activity-based costing system in which half of the overhead would continue to be allocated on the basis of direct labor-hours and half would be allocated on the basis of engineering design time. This time is expected to be distributed as follows during the upcoming year:

	Rascon	Parcel	Total
Engineering design time (in hours)....	3,000	3,000	6,000

- Compute the unit product costs for the two products using the proposed ABC system.
3. Explain why the product costs differ between the two systems.

EXERCISE 3-10 Cost Hierarchy and Activity Measures [LO1]

The following activities are carried out in Greenberry Company, a manufacturer of consumer goods.

- a. Direct labor workers assemble a product.
- b. Engineers design a new product.
- c. A machine is set up to process a batch.
- d. Numerically controlled machines cut and shape materials.
- e. The personnel department trains new employees concerning company policies.
- f. Raw materials are moved from the receiving dock to the production line.
- g. A random sample of 10 units in each batch is inspected for defects.

Required:

1. Classify each activity as a unit-level, batch-level, product-level, or facility-level cost.
2. Provide at least one example of an allocation base (i.e., activity measure) that could be used to allocate the cost of each activity listed above.

connect

PROBLEMS

Alternate problem set is available on the text website.

PROBLEM 3-11A ABC Cost Hierarchy [LO1]

Juneau Company manufactures a variety of products in a single facility. Consultants hired by the company to do an activity-based costing analysis have identified the following activities carried out in the company on a routine basis:

- a. Machines are set up between batches of different products.
- b. The company's grounds crew maintains planted areas surrounding the factory.
- c. A percentage of all completed goods are inspected on a random basis.
- d. Milling machines are used to make components for products.
- e. Employees are trained in general procedures.
- f. Purchase orders are issued for materials required in production.
- g. The maintenance crew does routine periodic maintenance on general-purpose equipment.
- h. The plant controller prepares periodic accounting reports.
- i. Material is received on the receiving dock and moved to the production area.
- j. The engineering department makes modifications in the designs of products.
- k. The human resources department screens and hires new employees.
- l. Production orders are issued for jobs.

Required:

1. Classify each of the above activities as a unit-level, batch-level, product-level, or facility-level activity.
2. For each of the above activities, suggest an activity measure that could be used to allocate its costs to products.

PROBLEM 3-12A Contrasting ABC and Conventional Product Costs [LO2, LO3, LO4]

For many years, Zapro Company manufactured a single product called a mono-relay. Then three years ago, the company automated a portion of its plant and at the same time introduced a second product called a bi-relay that has become increasingly popular. The bi-relay is a more complex product, requiring one hour of direct labor time per unit to manufacture and extensive machining in the automated portion of the plant. The mono-relay requires only 0.75 hours of direct labor time per unit and only a small amount of machining. Manufacturing overhead costs are currently assigned to products on the basis of direct labor-hours.

Despite the growing popularity of the company's new bi-relay, profits have been declining steadily. Management is beginning to believe that there may be a problem with the company's costing system. Material and labor costs per unit are as follows:

	Mono-Relay	Bi-Relay
Direct materials	\$35	\$48
Direct labor (0.75 hours and 1.0 hours @ \$12 per hour)	\$9	\$12

CHECK FIGURE

(3a) Mono-relay overhead cost: \$10.80

Management estimates that the company will incur \$1,000,000 in manufacturing overhead costs during the current year and 40,000 units of the mono-relay and 10,000 units of the hi-relay will be produced and sold.

Required:

1. Compute the predetermined manufacturing overhead rate assuming that the company continues to apply manufacturing overhead cost on the basis of direct labor-hours. Using this rate and other data from the problem, determine the unit product cost of each product.
2. Management is considering using activity-based costing to apply manufacturing overhead cost to products for external financial reports. The activity-based costing system would have the following four activity cost pools:

Activity Cost Pool	Activity Measure	Estimated Overhead Cost
Maintaining parts inventory	Number of part types	\$ 180,000
Processing purchase orders	Number of purchase orders	90,000
Quality control	Number of tests run	230,000
Machine related	Machine-hours	500,000
		<u>\$1,000,000</u>

Activity Measure	Expected Activity		
	Mono-Relay	Bi-Relay	Total
Number of part types	75	150	225
Number of purchase orders	800	200	1,000
Number of tests run	2,500	3,250	5,750
Machine-hours	4,000	6,000	10,000

3. Determine the activity rate (i.e., predetermined overhead rate) for each of the four activity cost pools.
3. Using the activity rates you computed in part (2) above, do the following:
 - a. Determine the total amount of manufacturing overhead cost that would be applied to each product using the activity-based costing system. After these totals have been computed, determine the amount of manufacturing overhead cost per unit of each product.
 - b. Compute the unit product cost of each product.
4. From the data you have developed in parts (1) through (3) above, identify factors that may account for the company's declining profits.

CHECK FIGURE
(3b) \$11.95 per diner



PROBLEM 3-13A Compute and Use Activity Rates to Determine the Costs of Serving Customers
[LO2, LO3, LO4]

Jordan's Lakeside is a popular restaurant located on Lake Washington in Seattle. The owner of the restaurant has been trying to better understand costs at the restaurant and has hired a student intern to conduct an activity-based costing study. The intern, in consultation with the owner, identified the following major activities:

Activity Cost Pool	Activity Measure
Serving a party of diners	Number of parties served
Serving a diner	Number of diners served
Serving drinks	Number of drinks ordered

A group of diners who ask to sit at the same table are counted as a party. Some costs, such as the costs of cleaning linen, are the same whether one person is at a table or the table is full. Other costs, such as washing dishes, depend on the number of diners served.

Data concerning these activities are displayed below.

	A	B	C	D	E	F	G	H
1		Serving a Party		Serving a Diner		Serving Drinks		Total
2	Total cost	\$33,000		\$138,000		\$24,000		\$195,000
3	Total activity	6,000	parties	15,000	diners	10,000	drinks	
4								

Prior to the activity-based costing study, the owner knew very little about the costs of the restaurant. She knew that the total cost for the month was \$195,000 and that 15,000 diners had been served. Therefore, the average cost per diner was \$13 ($\$195,000 \div 15,000 \text{ diners} = \13 per diner).

Required:

1. Compute the activity rates for each of the three activities.
2. According to the activity-based costing system, what is the total cost of serving each of the following parties of diners?
 - a. A party of four diners who order three drinks in total.
 - b. A party of two diners who do not order any drinks.
 - c. A lone diner who orders two drinks.
3. Convert the total costs you computed in part (1) above to costs per diner. In other words, what is the average cost per diner for serving each of the following parties?
 - a. A party of four diners who order three drinks in total.
 - b. A party of two diners who do not order any drinks.
 - c. A lone diner who orders two drinks.
4. Why do the costs per diner for the three different parties differ from each other and from the overall average cost of \$13 per diner?

PROBLEM 3-14A Contrasting ABC and Conventional Product Costs [LO2, LO3, LO4]

Siegel Corporation manufactures a product that is available in both a deluxe and a regular model. The company has made the regular model for years; the deluxe model was introduced several years ago to tap a new segment of the market. Since introduction of the deluxe model, the company's profits have steadily declined. Sales of the deluxe model have been increasing rapidly.

Overhead is applied to products on the basis of direct labor-hours. At the beginning of the current year, management estimated that \$2,000,000 in overhead costs would be incurred and the company would produce and sell 5,000 units of the deluxe model and 40,000 units of the regular model. The deluxe model requires 1.6 hours of direct labor time per unit, and the regular model requires 0.8 hours. Materials and labor costs per unit are given below:

	Deluxe	Regular
Direct materials cost per unit	\$150	\$112
Direct labor cost per unit	\$16	\$8

CHECK FIGURE
(3b) Regular: \$152 per unit



Required:

1. Compute the predetermined overhead rate using direct labor-hours as the basis for allocating overhead costs to products. Compute the unit product cost for one unit of each model.
2. An intern suggested that the company use activity-based costing to cost its products. A team was formed to investigate this idea. It came back with the recommendation that four activity cost pools be used. These cost pools and their associated activities are listed below:

Activity Cost Pool and Activity Measure		Activity		
		Deluxe	Regular	Total
Purchase orders (number of orders).....	\$ 84,000	400	800	1,200
Rework requests (number of requests).....	216,000	300	600	900
Product testing (number of tests).....	450,000	4,000	11,000	15,000
Machine related (machine-hours)	1,250,000	20,000	30,000	50,000
	<u>\$2,000,000</u>			

- Compute the activity rate (i.e., predetermined overhead rate) for each of the activity cost pools.
3. Assume that actual activity is as expected for the year. Using activity-based costing, do the following:
 - a. Determine the total amount of overhead that would be applied to each model for the year.
 - b. Compute the unit product cost for one unit of each model.
 4. Can you identify a possible explanation for the company's declining profits? If so, what is it?

CHECK FIGURE

(2d) Total overhead underapplied: \$17,000



PROBLEM 3-15A Activity-Based Costing Cost Flows [LO2, LO3, LO5]

Munoz Corporation uses activity-based costing to determine product costs for external financial reports. At the beginning of the year, management made the following estimates of cost and activity in the company's five activity cost pools:

Activity Cost Pool	Activity Measure	Estimated Overhead Cost	Expected Activity
Labor related.....	Direct labor-hours	\$210,000	35,000 DLHs
Purchase orders.....	Number of orders	\$72,000	900 orders
Product testing.....	Number of tests	\$168,000	1,400 tests
Template etching.....	Number of templates	\$315,000	10,500 templates
General factory.....	Machine-hours	\$840,000	70,000 MHs

Required:

1. Compute the activity rate (i.e., predetermined overhead rate) for each of the activity cost pools.
2. During the year, actual overhead cost and activity were recorded as follows:

Activity Cost Pool	Actual Overhead Cost	Actual Activity
Labor related.....	\$ 205,000	32,000 DLHs
Machine related.....	74,000	950 orders
Product testing.....	160,000	1,300 tests
Template etching.....	338,000	11,500 relays
General factory.....	825,000	68,000 MHs
Total manufacturing overhead cost.....	<u>\$1,602,000</u>	

- a. Prepare a journal entry to record the incurrence of actual manufacturing overhead cost for the year (credit Accounts Payable). Post the entry to the company's Manufacturing Overhead T-account.
 - b. Determine the amount of overhead cost applied to production during the year.
 - c. Prepare a journal entry to record the application of manufacturing overhead cost to Work in Process for the year. Post the entry to the company's Manufacturing Overhead T-account.
 - d. Determine the amount of underapplied or overapplied manufacturing overhead for the year.
3. The actual activity for the year was distributed among the company's four products as follows:

Activity Cost Pool	Actual Activity			
	Product A	Product B	Product C	Product D
Labor related (DLHs).....	6,000	7,500	10,000	8,500
Purchase orders (orders).....	150	300	100	400
Product testing (tests).....	400	175	225	500
Template etching (boards).....	0	4,500	0	7,000
General factory (MHs).....	10,000	20,000	17,000	21,000

- a. Determine the total amount of overhead cost applied to each product.
- b. Does the total amount of overhead cost applied to the products above tie in to the T-accounts in any way? Explain.

PROBLEM 3-16A Activity-Based Costing Cost Flows and Income Statement [LO2, LO5]

Aucton Corporation is a manufacturing company that uses activity-based costing for its external financial reports. The company's activity cost pools and associated data for the coming year appear below:

CHECK FIGURE
(4) Total overhead overapplied: \$8,000



Activity Cost Pool	Activity Measure	Estimated Overhead Cost	Expected Activity
Machining.....	Machine-hours	\$180,000	1,000 MHs
Purchase orders.....	Number of orders	\$90,000	600 orders
Parts management.....	Number of part types	\$60,000	300 part types
Testing	Number of tests	\$150,000	250 tests
General factory	Direct labor-hours	\$280,000	20,000 DLHs

At the beginning of the year, the company had inventory balances as follows:

Raw materials	\$7,000
Work in process	\$6,000
Finished goods	\$10,000

The following transactions were recorded for the year:

- Raw materials were purchased on account, \$595,000.
- Raw materials were withdrawn from the storeroom for use in production, \$600,000 (\$560,000 direct and \$40,000 indirect).
- The following costs were incurred for employee services: direct labor, \$90,000; indirect labor, \$300,000; sales commissions, \$85,000; and administrative salaries, \$245,000.
- Sales travel costs were incurred, \$38,000.
- Various factory overhead costs were incurred, \$237,000.
- Advertising costs were incurred, \$190,000.
- Depreciation was recorded for the year, \$270,000 (\$210,000 related to factory operations and \$60,000 related to selling and administrative activities).
- Manufacturing overhead was applied to products. Actual activity for the year was as follows:

Activity Cost Pool	Actual Activity
Machining	1,050 MHs
Purchase orders	580 orders
Parts management	330 part types
Testing.....	265 tests
General factory	21,000 DLHs

- Goods were completed and transferred to the finished goods warehouse. According to the company's activity-based costing system, these finished goods cost \$1,450,000 to manufacture.
- Goods were sold on account to customers during the year for a total of \$2,100,000. According to the company's activity-based costing system, the goods cost \$1,400,000 to manufacture.

Required:

- Compute the predetermined overhead rate (i.e., activity rate) for each activity cost pool.
- Prepare journal entries to record transactions (a) through (j) above.
- Post the entries in part (2) above to T-accounts.
- Compute the underapplied or overapplied manufacturing overhead cost. Prepare a journal entry to close any balance in the Manufacturing Overhead account to Cost of Goods Sold. Post the entry to the appropriate T-accounts.
- Prepare an income statement for the year.

CHECK FIGURE

(2d) Total overhead
overapplied: \$15,000

**PROBLEM 3-17A Cost Flows and Unit Product Costs in Activity-Based Costing [LO2, LO3, LO5]**

Hunter Corporation uses activity-based costing to determine product costs for external financial reports. At the beginning of the year, management made the following estimates of cost and activity in the company's five activity cost pools:

Activity Cost Pool	Activity Measure	Estimated Overhead Cost	Expected Activity
Labor related.....	Direct labor-hours	\$270,000	30,000 DLHs
Production orders.....	Number of orders	\$60,000	750 orders
Material receipts	Number of receipts	\$180,000	1,200 receipts
Relay assembly	Number of relays	\$320,000	8,000 relays
General factory	Machine-hours	\$840,000	60,000 MHs

Required:

1. Compute the activity rate (i.e., predetermined overhead rate) for each of the activity cost pools.
2. During the year, actual overhead cost and activity were recorded as follows:

Activity Cost Pool	Actual Overhead Cost	Actual Activity
Labor related.....	\$ 279,000	32,000 DLHs
Production orders.....	58,000	700 orders
Material receipts.....	190,000	1,300 tests
Relay assembly.....	320,000	7,900 relays
General factory	847,000	61,000 MHs
Total manufacturing overhead cost.....	<u>\$1,694,000</u>	

- a. Prepare a journal entry to record the incurrence of actual manufacturing overhead cost for the year (credit Accounts Payable). Post the entry to the company's Manufacturing Overhead T-account.
 - b. Determine the amount of overhead cost applied to production during the year.
 - c. Prepare a journal entry to record the application of manufacturing overhead cost to Work in Process for the year. Post the entry to the company's Manufacturing Overhead T-account.
 - d. Determine the amount of underapplied or overapplied manufacturing overhead for the year.
3. The actual activity for the year was distributed among the company's four products as follows:

Activity Cost Pool	Actual Activity			
	Product A	Product B	Product C	Product D
Labor related (DLHs)	8,000	11,000	4,000	9,000
Production orders (orders)	160	200	130	210
Materials receipts (receipts)	100	460	240	500
Relay assembly (relays)	2,700	0	5,200	0
General factory (MHs)	13,000	18,000	14,000	16,000

- a. Determine the total amount of overhead cost applied to each product.
- h. Does the total amount of overhead cost applied to the products above tie in to the T-accounts in any way? Explain.

CHECK FIGURE

(2b) X200 unit product
cost: \$213

PROBLEM 3-18A Contrast Activity-Based Costing and Conventional Product Costs [LO2, LO3, LO4]

Ellix Company manufactures two models of ultra-high fidelity speakers, the X200 model and the X99 model. Data regarding the two products follow:

	Direct Labor-Hours per Unit	Annual Production (units)	Total Direct Labor-Hours
Model X200	1.8	5,000	9,000
Model X99	0.9	30,000	27,000
			<u>36,000</u>

Additional information about the company follows:

- Model X200 requires \$72 in direct materials per unit, and model X99 requires \$50.
- The direct labor wage rate is \$10 per hour.
- The company has always used direct labor-hours as the base for applying manufacturing overhead cost to products.
- Model X200 is more complex to manufacture than model X99 and requires the use of special equipment. Consequently, the company is considering the use of activity-based costing to apply manufacturing overhead cost to products. Three activity cost pools have been identified as follows:



Activity Cost Pool	Activity Measure	Estimated Overhead Cost
Machine setups.....	Number of part types	\$ 360,000
Special processing.....	Machine-hours	180,000
General factory	Direct labor-hours	1,260,000
		<u>\$1,800,000</u>

Activity Measure	Expected Activity		
	Model X200	Model X99	Total
Number of setups	50	100	150
Machine-hours	12,000	0	12,000
Direct labor-hours	9,000	27,000	36,000

Required:

- Assume that the company continues to use direct labor-hours as the base for applying overhead cost to products.
 - Compute the predetermined overhead rate.
 - Compute the unit product cost of each model.
- Assume that the company decides to use activity-based costing to apply manufacturing overhead cost to products.
 - Compute the predetermined overhead rate for each activity cost pool and determine the amount of overhead cost that would be applied to each model using the activity-based costing system.
 - Compute the unit product cost of each model.
- Explain why manufacturing overhead cost shifts from Model X99 to Model X200 under activity-based costing.

BUILDING YOUR SKILLS

ETHICS CHALLENGE [LO1]

You and your friends go to a restaurant as a group. At the end of the meal, the issue arises of how the bill for the group should be shared. One alternative is to figure out the cost of what each individual consumed and divide up the bill accordingly. Another alternative is to split the bill equally among the individuals.



Required:

Which system for dividing the bill is more equitable? Which system is easier to use? How does this issue relate to the material covered in this chapter?



COMMUNICATING IN PRACTICE [LO1]

You often provide advice to Maria Graham, a client who is interested in diversifying her company. Maria is considering the purchase of a small manufacturing company that assembles and packages its many products by hand. She plans to automate the factory and her projections indicate that the company will once again be profitable within two to three years. During her review of the company's records, she discovered that the company currently uses direct labor-hours to allocate overhead to its products. Because of its simplicity, Maria hopes that this approach can continue to be used.

Required:

Write a memorandum to Maria that addresses whether or not direct labor should continue to be used as an allocation base for overhead.



TEAMWORK IN ACTION [LO1]

Your team should visit and closely observe the operations at a fast-food restaurant.

Required:

Identify activities and costs at the restaurant that fall into each of the following categories:

- a. Unit-level activities and costs.
- b. Customer-level activities and costs. (This is like a batch-level activity at a manufacturing company.)
- c. Product-level activities and costs.
- d. Facility-level activities and costs.

CHECK FIGURE

(2) Standard model unit product cost: \$29.98 per unit



ANALYTICAL THINKING [LO2, LO3, LO4]

"A dollar of gross margin per briefcase? That's ridiculous!" roared Art DeJans, president of CarryAll, Inc. "Why do we go on producing those standard briefcases when we're able to make over \$15 per unit on our specialty items? Maybe it's time to get out of the standard line and focus the whole plant on specialty work."

Mr. DeJans was referring to a summary of unit costs and revenues that he had just received from the company's Accounting Department:

	Standard Briefcases	Specialty Briefcases
Selling price per unit	\$36	\$40
Unit product cost	<u>35</u>	<u>25</u>
Gross margin per unit	<u>\$ 1</u>	<u>\$15</u>

CarryAll produces briefcases from leather, fabric, and synthetic materials in a single plant. The basic product is a standard briefcase that is made from leather lined with fabric. The standard briefcase is a high-quality item and has sold well for many years.

Last year, the company decided to expand its product line and produce specialty briefcases for special orders. These briefcases differ from the standard in that they vary in size, they contain the finest leather and synthetic materials, and they are imprinted with the buyer's name. To reduce labor costs on the specialty briefcases, automated machines do most of the cutting and stitching. These machines are used to a much lesser degree in the production of standard briefcases.

"I agree that the specialty business is looking better and better," replied Sally Henrie, the company's marketing manager. "And there seems to be plenty of specialty work out there, particularly because the competition hasn't been able to touch our price. Did you know that Armor Company, our biggest competitor, charges over \$50 a unit for its specialty items? Now that's what I call gouging the customer!"

A breakdown of the manufacturing cost for each of CarryAll's product lines is given below:

	Standard Briefcases	Specialty Briefcases
Units produced each month.....	<u>10,000</u>	<u>2,500</u>
Direct materials:		
Leather.....	\$15.00	\$ 7.50
Fabric.....	5.00	5.00
Synthetic.....	<u>0</u>	<u>5.00</u>
Total direct materials.....	20.00	17.50
Direct labor (0.5 DLH and 0.25 DLH @ \$12 per DLH).....	6.00	3.00
Manufacturing overhead (0.5 DLH and 0.25 DLH @ \$18 per DLH).....	<u>9.00</u>	<u>4.50</u>
Total cost per unit.....	<u>\$35.00</u>	<u>\$25.00</u>

Manufacturing overhead is applied to products on the basis of direct labor-hours. The rate of \$18 per direct labor-hour is determined by dividing the total manufacturing overhead cost for a month by the direct labor-hours:

$$\text{Predetermined overhead rate} = \frac{\text{Manufacturing overhead}}{\text{Direct labor-hours}} = \frac{\$101,250}{5,625 \text{ DLHs}} = \$18 \text{ per DLH}$$

The following additional information is available about the company and its products:

- Standard briefcases are produced in batches of 200 units, and specialty briefcases are produced in batches of 25 units. Thus, the company does 50 setups for the standard items each month and 100 setups for the specialty items. A setup for the standard items requires one hour, whereas a setup for the specialty items requires two hours.
- All briefcases are inspected to ensure that quality standards are met. A total of 300 hours of inspection time is spent on the standard briefcases and 500 hours of inspection time is spent on the specialty briefcases each month.
- A standard briefcase requires 0.5 hours of machine time, and a specialty briefcase requires 2 hours of machine time.
- The company is considering the use of activity-based costing as an alternative to its traditional costing system for computing unit product costs. Since these unit product costs will be used for external financial reporting, all manufacturing overhead costs are to be allocated to products and nonmanufacturing costs are to be excluded from product costs. The activity-based costing system has already been designed and costs allocated to the activity cost pools. The activity cost pools and activity measures are detailed below:

Activity Cost Pool	Activity Measure	Estimated Overhead Cost
Purchasing.....	Number of orders	\$ 12,000
Material handling.....	Number of receipts	15,000
Production orders and setup.....	Setup hours	20,250
Inspection.....	Inspection-hours	16,000
Frame assembly.....	Assembly-hours	8,000
Machine related.....	Machine-hours	<u>30,000</u>
		<u>\$101,250</u>

Activity Measure	Expected Activity		Total
	Standard Briefcase	Specialty Briefcase	
Number of orders:			
Leather.....	34	6	40
Fabric.....	48	12	60
Synthetic material.....	0	100	100
Number of receipts:			
Leather.....	52	8	60
Fabric.....	64	16	80
Synthetic material.....	0	160	160
Setup hours.....	?	?	?
Inspection-hours.....	?	?	?
Assembly-hours.....	800	800	1,600
Machine-hours.....	?	?	?

Required:

- Using activity-based costing, determine the amount of manufacturing overhead cost that would be applied to each standard briefcase and each specialty briefcase.
- Using the data computed in part (1) above and other data from the case as needed, determine the unit product cost of each product line from the perspective of the activity-based costing system.
- Within the limitations of the data that have been provided, evaluate the president’s concern about the profitability of the two product lines. Would you recommend that the company shift its resources entirely to production of specialty briefcases? Explain.
- Sally Henric stated that “the competition hasn’t been able to touch our price” on specialty business. Why do you suppose the competition hasn’t been able to touch CarryAll’s price?

Adapted from a case written by Harold P. Roth and Imogene Posey, “Management Accounting Case Study: CarryAll Company,” *Management Accounting Campus Report*, Institute of Management Accountants (Fall 1991), p. 9. Used by permission.

CASE [LO2, LO3, LO4]

Java Source, Inc. (JSI), is a processor and distributor of a variety of blends of coffee. The company buys coffee beans from around the world and roasts, blends, and packages them for resale. JSI offers a large variety of different coffees that it sells to gourmet shops in one-pound bags. The major cost of the coffee is raw materials. However, the company’s predominantly automated roasting, blending, and packing processes require a substantial amount of manufacturing overhead. The company uses relatively little direct labor.

Some of JSI’s coffees are very popular and sell in large volumes, while a few of the newer blends sell in very low volumes. JSI prices its coffees at manufacturing cost plus a markup of 25%, with some adjustments made to keep the company’s prices competitive.

For the coming year, JSI’s budget includes estimated manufacturing overhead cost of \$2,200,000. JSI assigns manufacturing overhead to products on the basis of direct labor-hours. The expected direct labor cost totals \$600,000, which represents 50,000 direct labor hours. Based on the sales budget and expected raw materials costs, the company will purchase and use \$5,000,000 of raw materials (mostly coffee beans) during the year.

The expected costs for direct materials and direct labor for one-pound bags of two of the company’s coffee products appear below.

	Kenya Dark	Viet Select
Direct materials.....	\$4.50	\$2.90
Direct labor (0.02 hours per bag).....	\$0.24	\$0.24

JSI’s controller believes that the company’s traditional costing system may be providing misleading cost information. To determine whether or not this is correct, the controller has prepared an analysis of the year’s expected manufacturing overhead costs, as shown in the following table:

CHECK FIGURE

(2b) Overhead cost per pound of Viet Select: \$1.90



Activity Cost Pool	Activity Measure	Expected Activity for the Year	Expected Cost for the Year
Purchasing.....	Purchase orders	2,000 orders	\$ 560,000
Material handling.....	Number of setups	1,000 setups	193,000
Quality control.....	Number of batches	500 batches	90,000
Roasting.....	Roasting hours	95,000 roasting hours	1,045,000
Blending.....	Blending hours	32,000 blending hours	192,000
Packaging.....	Packaging hours	24,000 packaging hours	120,000
Total manufacturing overhead cost.....			<u>\$2,200,000</u>

Data regarding the expected production of Kenya Dark and Viet Select coffee are presented below.

	Kenya Dark	Viet Select
Expected sales.....	80,000 pounds	4,000 pounds
Batch size.....	5,000 pounds	500 pounds
Setups.....	2 per batch	2 per batch
Purchase order size.....	20,000 pounds	500 pounds
Roasting time per 100 pounds.....	1.5 roasting hours	1.5 roasting hours
Blending time per 100 pounds.....	0.5 blending hours	0.5 blending hours
Packaging time per 100 pounds.....	0.3 packaging hours	0.3 packaging hours

Required:

- Using direct labor-hours as the base for assigning manufacturing overhead cost to products, do the following:
 - Determine the predetermined overhead rate that will be used during the year.
 - Determine the unit product cost of one pound of the Kenya Dark coffee and one pound of the Viet Select coffee.
- Using activity-based costing as the basis for assigning manufacturing overhead cost to products, do the following:
 - Determine the total amount of manufacturing overhead cost assigned to the Kenya Dark coffee and to the Viet Select coffee for the year.
 - Using the data developed in part (2a) above, compute the amount of manufacturing overhead cost per pound of the Kenya Dark coffee and the Viet Select coffee. Round all computations to the nearest whole cent.
 - Determine the unit product cost of one pound of the Kenya Dark coffee and one pound of the Viet Select coffee.
- Write a brief memo to the president of JSI explaining what you have found in parts (1) and (2) above and discussing the implications to the company of using direct labor as the base for assigning manufacturing overhead cost to products.

(CMA, adapted)

RESEARCH AND APPLICATION

[LO1]

The questions in this exercise are based on JetBlue Airways Corporation. To answer the questions, you will need to download JetBlue's Form 10-K/A for the year ended December 31, 2004 at www.sec.gov/edgar/searchedgar/companysearch.html. Once at this website, input CIK code 1158463 and hit enter. In the gray box on the right-hand side of your computer screen define the scope of your search by inputting 10-K and then pressing enter. Select the 10-K/A with a filing date of March 8, 2005. You do not need to print the 10-K/A to answer the questions.



Required:

1. What is JetBlue's strategy for success in the marketplace? Does the company rely primarily on a customer intimacy, operational excellence, or product leadership customer value proposition? What evidence supports your conclusion?
2. What business risks does JetBlue face that may threaten the company's ability to satisfy stockholder expectations? What are some examples of control activities that the company could use to reduce these risks? (*Hint:* Focus on pages 17–23 of the 10-K/A.)
3. How can the concept of unit-level activities be applied to an airline? More specifically, what are two examples of unit-level activities for JetBlue? What steps has JetBlue taken to manage these unit-level activities more efficiently?
4. How can the concept of batch-level activities be applied to an airline? What are two examples of batch-level activities for JetBlue? What steps has JetBlue taken to manage these batch-level activities more efficiently?

4

Systems Design: Process Costing

<< A LOOK BACK

We described a basic job-order costing system in Chapter 2 that used a single plantwide overhead rate. Then, in Chapter 3, we looked at activity-based costing, a more sophisticated technique that uses a variety of allocation bases to assign overhead costs to products.

A LOOK AT THIS CHAPTER

Chapter 4 covers process costing, which is an important alternative to job-order costing. In process costing, departmental costs are applied uniformly to the products processed through the department during the period.

A LOOK AHEAD >>

After discussing how costs respond to changes in the level of business activity, we will introduce the contribution format income statement in Chapter 5.

CHAPTER OUTLINE

Comparison of Job-Order and Process Costing

- Similarities between Job-Order and Process Costing
- Differences between Job-Order and Process Costing

Cost Flows in Process Costing

- Processing Departments
- The Flow of Materials, Labor, and Overhead Costs
- Materials, Labor, and Overhead Cost Entries

Equivalent Units of Production

- Weighted-Average Method

Compute and Apply Costs

- Cost per Equivalent Unit—Weighted-Average Method
- Applying Costs—Weighted-Average Method
- Cost Reconciliation Report—Weighted-Average Method

SUPPLEMENT: PROCESS COSTING USING THE FIFO METHOD (available on the Web at www.mhhe.com/brewer5e)

Equivalent Units—FIFO Method

Comparison of Equivalent Units of Production under the Weighted-Average and FIFO Methods

Cost per Equivalent Unit—FIFO Method

Applying Costs—FIFO Method

Cost Reconciliation Report—FIFO Method



DECISION FEATURE

Costing the “Quicker-Picker-Upper”

If you have ever spilled milk, there is a good chance that you used Bounty paper towels to clean up the mess. **Procter & Gamble (P&G)** manufactures Bounty in two main processing departments—Paper Making and Paper Converting. In the Paper Making Department, wood pulp is converted into paper and then spooled into 2,000-pound rolls that are inventoried and retrieved as needed to supply the paper converting process. In the Paper Converting Department, two 2,000-pound rolls of paper are simultaneously unwound into a machine that creates a two-ply paper towel that is decorated, perforated, and embossed to create texture. The large sheets of paper towels that emerge from this process are wrapped around a cylinder-shaped cardboard core measuring eight feet in length. Once enough sheets wrap around the core, the eight-foot roll is cut into individual rolls of Bounty that are sent down a conveyor to be wrapped, packed, and shipped.

In this type of manufacturing environment, costs cannot be readily traced to individual rolls of Bounty; however, given the homogeneous nature of the product, the total costs incurred in the Paper Making Department can be spread uniformly across its output of 2,000-pound rolls of paper. Similarly, the total costs incurred to produce a particular style of Bounty in the Paper Converting Department (including the cost of the 2,000-pound rolls that are transferred in from the Paper Making Department) can be spread uniformly across the number of cases produced of that style.

P&G uses a similar costing approach for many of its products such as Tide, Crest toothpaste, and Pringles.

Source: Conversation with Brad Bays, retired financial executive from Procter & Gamble.

LEARNING OBJECTIVES



After studying Chapter 4, you should be able to:

- LO1** Record the flow of materials, labor, and overhead through a process costing system.
- LO2** Compute the equivalent units of production using the weighted-average method.
- LO3** Compute the cost per equivalent unit using the weighted-average method.
- LO4** Assign costs to units using the weighted-average method.
- LO5** Prepare a cost reconciliation report.

As explained in Chapter 2, job-order costing and process costing are two common methods for determining unit product costs. A job-order costing system is used when many different jobs or products are worked on each period. Examples of industries that use job-order costing include furniture manufacturing, special-order printing, shipbuilding, and many types of service organizations.

By contrast, **process costing** is used most commonly in industries that convert raw materials into homogeneous (i.e., uniform) products, such as bricks, soda, or paper, on a continuous basis. Examples of companies that would use process costing include **Reynolds Aluminum** (aluminum ingots), **Scott Paper** (toilet paper), **General Mills** (flour), **Exxon** (gasoline and lubricating oils), **Coppertone** (sunscreens), and **Kellogg** (breakfast cereals). In addition, process costing is sometimes used in companies with assembly operations. A form of process costing may also be used in utilities that produce gas, water, and electricity.

Our purpose in this chapter is to explain how product costing works in a process costing system.

COMPARISON OF JOB-ORDER AND PROCESS COSTING

In some ways process costing is very similar to job-order costing, and in some ways it is very different. In this section, we focus on these similarities and differences to provide a foundation for the detailed discussion of process costing that follows.

Similarities between Job-Order and Process Costing

Much of what you learned in Chapter 2 about costing and cost flows applies equally well to process costing in this chapter. We are not throwing out all that we have learned about costing and starting from “scratch” with a whole new system. The similarities between job-order and process costing can be summarized as follows:

1. Both systems have the same basic purposes—to assign material, labor, and manufacturing overhead costs to products and to provide a mechanism for computing unit product costs.
2. Both systems use the same basic manufacturing accounts, including Manufacturing Overhead, Raw Materials, Work in Process, and Finished Goods.
3. The flow of costs through the manufacturing accounts is basically the same in both systems.

As can be seen from this comparison, much of the knowledge that you have already acquired about costing is applicable to a process costing system. Our task now is to refine and extend your knowledge to process costing.

Differences between Job-Order and Process Costing

There are three differences between job-order and process costing. First, process costing is used when a company produces a continuous flow of units that are indistinguishable from one another. Job-order costing is used when a company produces many different jobs that have unique production requirements. Second, under process costing, it makes no sense to try to identify materials, labor, and overhead costs with a particular customer order (as we did with job-order costing) because each order is just one of many that are filled from a continuous flow of virtually identical units from the production line. Accordingly, process costing accumulates costs by department (rather than by order) and assigns these costs uniformly to all units that pass through the department during a period. Job cost sheets (which we used for job-order costing) are not used to accumulate costs. Third, process costing systems compute unit costs by department. This differs from job-order costing where unit costs are computed by job on the job cost sheet. Exhibit 4-1 summarizes the differences just described.

Job-Order Costing

1. Many different jobs are worked on during each period, with each job having different production requirements.
2. Costs are accumulated by individual job.
3. Unit costs are computed *by job* on the job cost sheet.

Process Costing

1. A single product is produced either on a continuous basis or for long periods of time. All units of product are identical.
2. Costs are accumulated by department.
3. Unit costs are computed *by department*.

EXHIBIT 4-1

Differences between Job-Order and Process Costing

Cost Analyst**DECISION MAKER**

Your company is planning a new production facility that will process wood chips into standard rolls of newsprint for sale to printers. Would you recommend that the company use job-order costing or process costing to account for the costs of producing the rolls of newsprint?

COST FLOWS IN PROCESS COSTING

Before going through a detailed example of process costing, it will be helpful to see how, in a general way, manufacturing costs flow through a process costing system.

Processing Departments

A **processing department** is an organizational unit where work is performed on a product and where materials, labor, or overhead costs are added to the product. For example, a **Nalley's** potato chip factory might have three processing departments—one for preparing potatoes, one for cooking, and one for inspecting and packaging. A brick factory might have two processing departments—one for mixing and molding clay into brick form and one for firing the molded brick. Some products and services may go through a number of processing departments, while others may go through only one or two. Regardless of the number of processing departments, they all have two essential features. First, the activity in the processing department is performed uniformly on all of the units passing

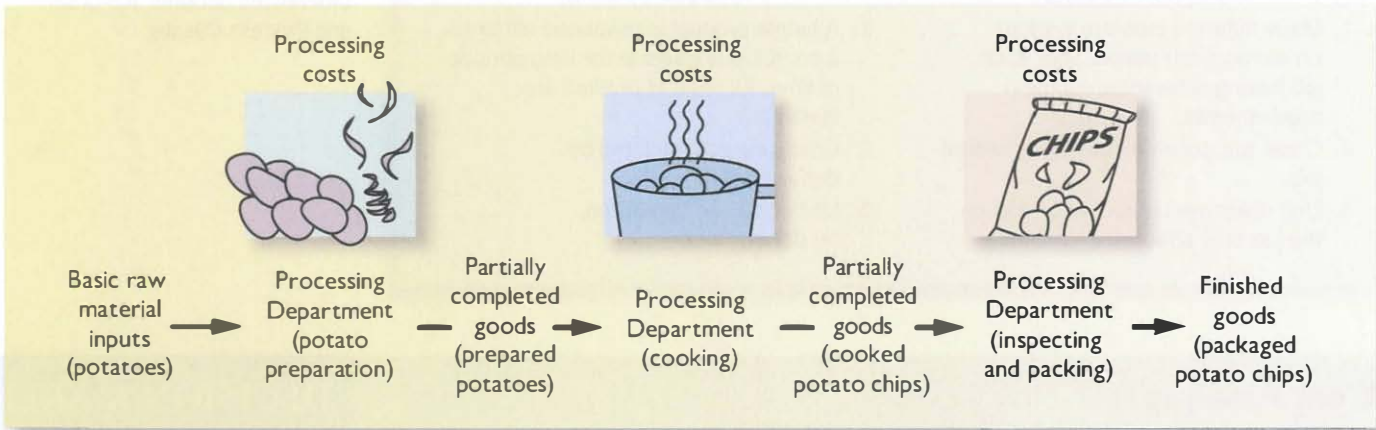
Coca-Cola's Processing Departments**IN BUSINESS**

In 2004, the **Coca-Cola Company** sold more than \$21 billion of products in over 200 countries. Some of the company's key processing steps include washing and rinsing bottles, mixing and blending ingredients, filling and capping bottles, and labeling and packaging bottles. Raw material costs are added at various stages during this process. For example, sugar, filtered water, carbon dioxide, and syrup are added during the mixing and blending stage of the process. Bottle caps are added during the filling and capping step, and paper labels are added during the labeling and packaging stage.

Coca-Cola's manufacturing process is well suited for process costing because it produces a continuous stream of identical bottles of soda. The material costs and conversion costs that are incurred at the various stages of the production process can be assigned to products by spreading them evenly over the total volume of production.

Source: The Coca-Cola Company 2004 annual report.

EXHIBIT 4-2 Sequential Processing Departments



through it. Second, the output of the processing department is homogeneous; in other words, all of the units produced are identical.

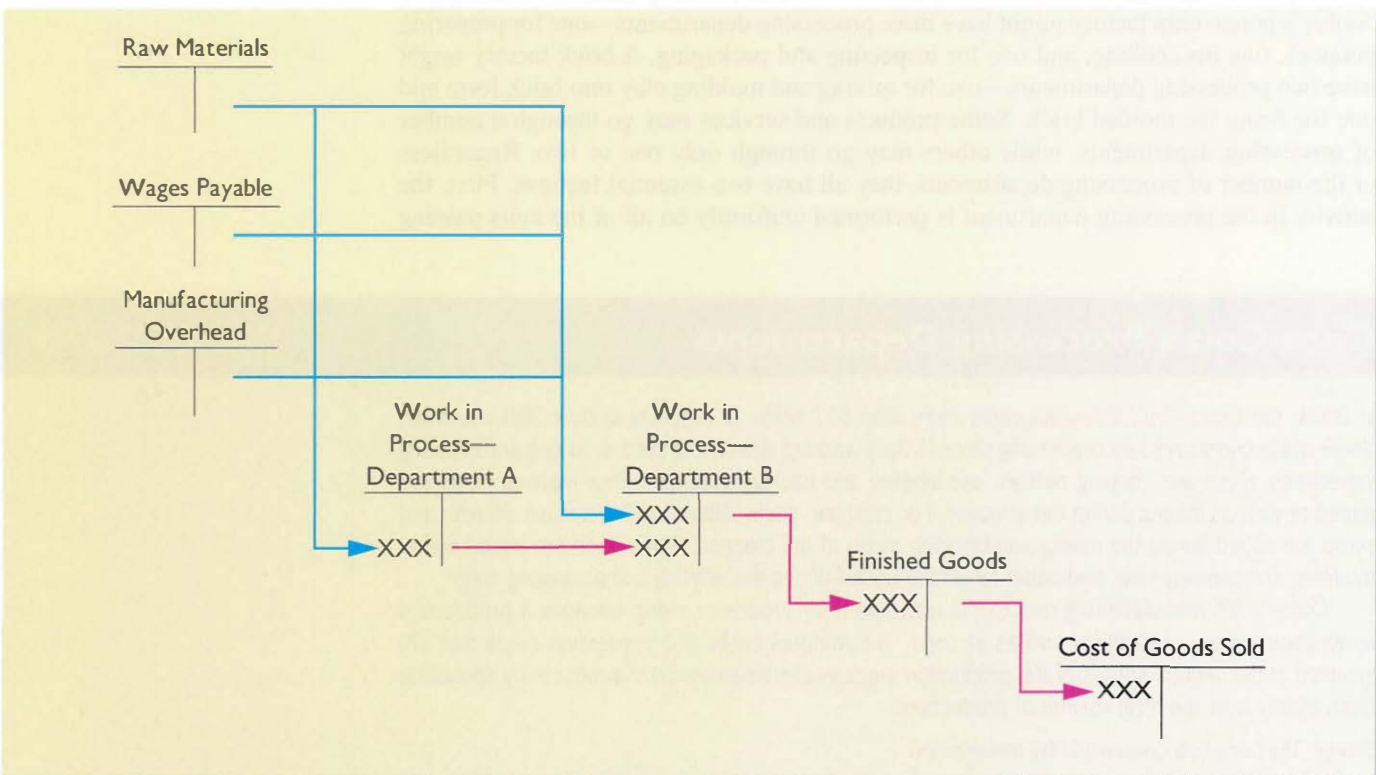
Products in a process costing environment, such as bricks or potato chips, typically flow in sequence from one department to another as in Exhibit 4-2.

The Flow of Materials, Labor, and Overhead Costs

Cost accumulation is simpler in a process costing system than in a job-order costing system. In a process costing system, instead of having to trace costs to hundreds of different jobs, costs are traced to only a few processing departments.

A T-account model of materials, labor, and overhead cost flows in a process costing system is shown in Exhibit 4-3. Several key points should be noted from this exhibit.

EXHIBIT 4-3 T-Account Model of Process Costing Flows



First, note that a separate Work in Process account is maintained for *each processing department*. In contrast, in a job-order costing system the entire company may have only one Work in Process account. Second, note that the completed production of the first processing department (Department A in the exhibit) is transferred to the Work in Process account of the second processing department (Department B). After further work in Department B, the completed units are then transferred to Finished Goods. (In Exhibit 4–3, we show only two processing departments, but a company can have many processing departments.)

Finally, note that materials, labor, and overhead costs can be added in *any* processing department—not just the first. Costs in Department B’s Work in Process account consist of the materials, labor, and overhead costs incurred in Department B plus the costs attached to partially completed units transferred in from Department A (called transferred-in costs).

Materials, Labor, and Overhead Cost Entries

To complete our discussion of cost flows in a process costing system, in this section we show journal entries relating to materials, labor, and overhead costs at Megan’s Classic Cream Soda, a company that has two processing departments—Formulating and Bottling. In the Formulating Department, ingredients are checked for quality and then mixed and injected with carbon dioxide to create bulk cream soda. In the Bottling Department, bottles are checked for defects, filled with cream soda, capped, visually inspected again for defects, and then packed for shipping.

LEARNING OBJECTIVE 1
Record the flow of materials, labor, and overhead through a process costing system.



Materials Costs As in job-order costing, materials are drawn from the storeroom using a materials requisition form. Materials can be added in any processing department, although it is not unusual for materials to be added only in the first processing department, with subsequent departments adding only labor and overhead costs.

At Megan’s Classic Cream Soda, some materials (i.e., water, flavors, sugar, and carbon dioxide) are added in the Formulating Department and some materials (i.e., bottles, caps, and packing materials) are added in the Bottling Department. The journal entry to record the materials used in the first processing department, the Formulating Department, is as follows:

Work in Process—Formulating	XXX	
Raw Materials		XXX

The journal entry to record the materials used in the second processing department, the Bottling Department, is as follows:

Work in Process—Bottling	XXX	
Raw Materials		XXX

Labor Costs In process costing, labor costs are traced to departments—not to individual jobs. The following journal entry records the labor costs in the Formulating Department at Megan’s Classic Cream Soda:

Work in Process—Formulating	XXX	
Salaries and Wages Payable		XXX

A similar entry would be made to record labor costs in the Bottling Department.

Overhead Costs In process costing, as in job-order costing, predetermined overhead rates are usually used. Manufacturing overhead cost is applied according to the amount of the allocation base that is incurred in the department. The following journal entry records the overhead cost applied in the Formulating Department:

Work in Process—Formulating	XXX	
Manufacturing Overhead		XXX

A similar entry would be made to apply manufacturing overhead costs in the Bottling Department.

Completing the Cost Flows Once processing has been completed in a department, the units are transferred to the next department for further processing, as illustrated in the T-accounts in Exhibit 4-3. The following journal entry transfers the cost of partially completed units from the Formulating Department to the Bottling Department:

Work in Process—Bottling	XXX	
Work in Process—Formulating		XXX

After processing has been completed in the Bottling Department, the costs of the completed units are transferred to the Finished Goods inventory account:

Finished Goods	XXX	
Work in Process—Bottling		XXX

Finally, when a customer’s order is filled and units are sold, the cost of the units is transferred to Cost of Goods Sold:

Cost of Goods Sold	XXX	
Finished Goods		XXX

To summarize, the cost flows between accounts are basically the same in a process costing system as they are in a job-order costing system. The only difference at this point is that in a process costing system each department has a separate Work in Process account.

IN BUSINESS

The Difference between Labor Rates and Labor Cost

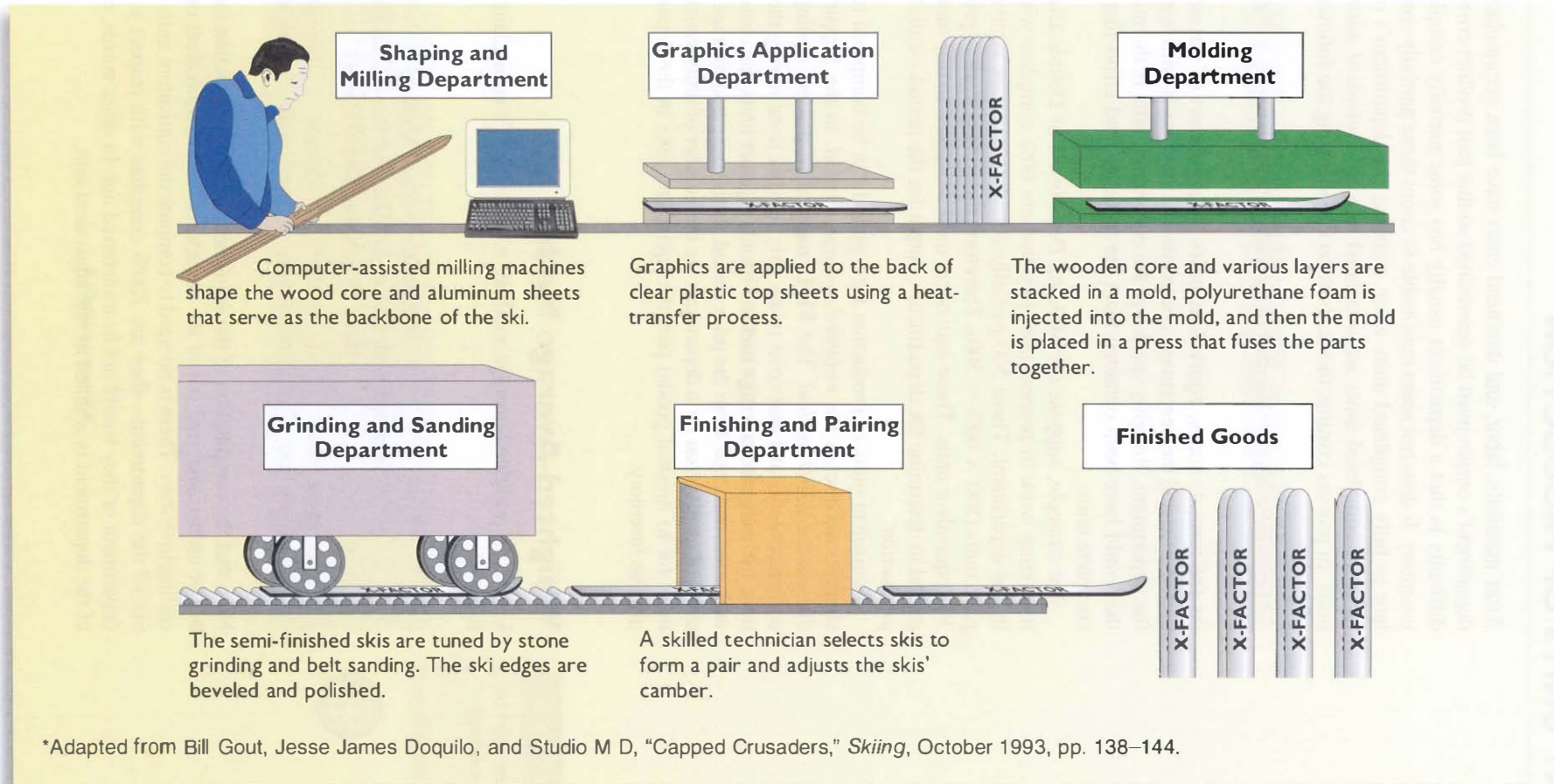


The emergence of China as a global competitor has increased the need for managers to understand the difference between labor rates and labor cost. Labor rates reflect the amount paid to employees per hour or month. Labor costs measure the employee compensation paid per unit of output. For example, **Tenneco** has plants in Shanghai, China, and Litchfield, Michigan, that both manufacture exhaust systems for automobiles. The monthly labor rate per employee at the Shanghai plant ranges from \$210–\$250, whereas the same figure for the Litchfield plant ranges from \$1,880–\$4,064. A naïve interpretation of these labor rates would be to automatically assume that the Shanghai plant is the lower labor cost facility. A wiser comparison of the two plants’ labor costs would account for the fact that the Litchfield plant produced 1.4 million exhaust systems in 2005 compared to 400,000 units at the Shanghai plant, while having only 20% more employees than the Shanghai plant.

Source: Alex Taylor III, “A Tale of Two Factories,” *Fortune*, September 18, 2006, pp. 118–126.

We now turn our attention to Double Diamond Skis, a company that manufactures a high-performance deep-powder ski, and that uses process costing to determine its unit product costs. The company’s production process is illustrated in Exhibit 4-4. Skis go through a sequence of five processing departments, starting with the Shaping and Milling Department and ending with the Finishing and Pairing Department. The basic idea in process costing is to add together all of the costs incurred in a department during a period and then to spread those costs uniformly across the units processed in that department during that period. As we shall see, applying this simple idea involves a few complications.

EXHIBIT 4-4 The Production Process at Double Diamond Skis*



*Adapted from Bill Gout, Jesse James Doquilo, and Studio M D, "Capped Crusaders," *Skiing*, October 1993, pp. 138-144.

EQUIVALENT UNITS OF PRODUCTION

After materials, labor, and overhead costs have been accumulated in a department, the department's output must be determined so that unit product costs can be computed. The difficulty is that a department usually has some partially completed units in its ending inventory. It does not seem reasonable to count these partially completed units as equivalent to fully completed units when counting the department's output. Therefore, these partially completed units are translated into an *equivalent* number of fully completed units. In process costing, this translation is done using the following formula:

$$\text{Equivalent units} = \text{Number of partially completed units} \times \text{Percentage completion}$$

As the formula states, **equivalent units** is the product of the number of partially completed units and the percentage completion of those units with respect to the processing in the department. Roughly speaking, the equivalent units is the number of complete units that could have been obtained from the materials and effort that went into the partially complete units.

For example, suppose the Molding Department at Double Diamond has 500 units in its ending work in process inventory that are 60% complete with respect to processing in the department. These 500 partially complete units are equivalent to 300 fully complete units ($500 \times 60\% = 300$). Therefore, the ending work in process inventory contains 300 equivalent units. These equivalent units are added to any units completed during the period to determine the department's output for the period—called the *equivalent units of production*.

Equivalent units of production for a period can be computed in different ways. In this chapter, we discuss the *weighted-average method*. In the Supplement to Chapter 4, we discuss the *FIFO method*. The **FIFO method** of process costing is a method in which equivalent units and unit costs relate only to work done during the current period. In contrast, the **weighted-average method** blends together units and costs from the current period with units and costs from the prior period. In the weighted-average method, the **equivalent units of production** for a department are the number of units transferred to the next department (or to finished goods) plus the equivalent units in the department's ending work in process inventory.

LEARNING OBJECTIVE 2

Compute the equivalent units of production using the weighted-average method.



Weighted-Average Method

Under the weighted-average method, a department's equivalent units are computed as follows:

Weighted-Average Method (A Separate Calculation is Made for Each Cost Category in Each Processing Department)

$$\text{Equivalent units of production} = \text{Units transferred to the next department or to finished goods} + \text{Equivalent units in ending work in process inventory}$$

Note that the computation of the equivalent units of production involves adding the number of units transferred out of the department to the equivalent units in the department's ending inventory. There is no need to compute the equivalent units for the units transferred out of the department—they are 100% complete with respect to the work done in that department or they would not be transferred out. In other words, each unit transferred out of the department is counted as one equivalent unit.

Consider the Shaping and Milling Department at Double Diamond. This department uses computerized milling machines to precisely shape the wooden core and metal sheets that will be used to form the backbone of the ski. (See Exhibit 4-4 for an overview of the production process at Double Diamond.) The activity shown below took place in the department in May.

Note the use of the term *conversion* in the table below. **Conversion cost**, as defined in an earlier chapter, is direct labor cost plus manufacturing overhead cost. In process costing, conversion cost is often treated as a single element of product cost.

Note that the beginning work in process inventory was 55% complete with respect to materials costs and 30% complete with respect to conversion costs. This means that 55% of the materials costs required to complete the units in the department had already been incurred. Likewise, 30% of the conversion costs required to complete the units had already been incurred.

Shaping and Milling Department	Units	Percent Complete	
		Materials	Conversion
Beginning work in process	200	55%	30%
Units started into production during May	5,000		
Units completed during May and transferred to the next department	4,800	100%*	100%*
Ending work in process	400	40%	25%

*We always assume that units transferred out of a department are 100% complete with respect to the processing done in that department.

Two equivalent unit figures must be computed—one for materials and one for conversion. These computations are shown in Exhibit 4-5.

Note that the computations in Exhibit 4-5 ignore the fact that the units in the beginning work in process inventory were partially complete. For example, the 200 units in beginning inventory were already 30% complete with respect to conversion costs. Nevertheless, the weighted-average method is concerned only with the 4,900 equivalent units that are in ending inventories and in units transferred to the next department; it is not concerned with the fact that the beginning inventory was already partially complete. In other words, the 4,900 equivalent units computed using the weighted-average method include work that was accomplished in prior periods. This is a key point concerning the weighted-average method and it is easy to overlook.

Exhibit 4-6 provides an alternative way of looking at the computation of equivalent units of production. This exhibit depicts the equivalent units computation for conversion costs. Study it carefully before going on.

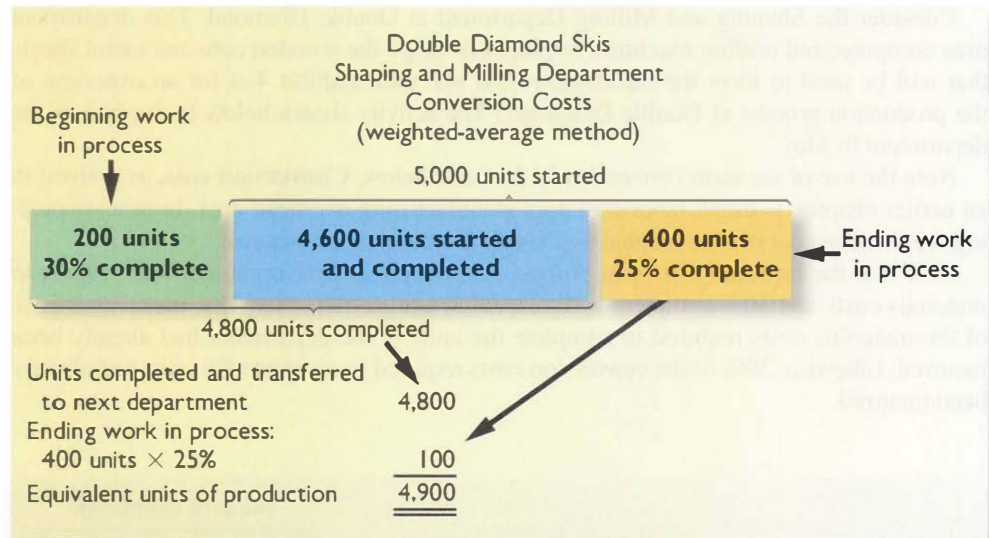
Shaping and Milling Department	Materials	Conversion
Units transferred to the next department	4,800	4,800
Ending work in process:		
Materials: 400 units × 40% complete	160	
Conversion: 400 units × 25% complete		100
Equivalent units of production	<u>4,960</u>	<u>4,900</u>

EXHIBIT 4-5

Equivalent Units of Production:
Weighted-Average Method

EXHIBIT 4-6

Visual Perspective of Equivalent Units of Production

**IN BUSINESS****Cutting Conversion Costs**

Cemex SA, the world's third largest cement maker, owns 54 plants. Each of these plants consumes 800 tons of fuel a day heating kilns to 2,700 degrees Fahrenheit. Consequently, energy costs account for 40% of the company's overall conversion costs. Historically, Cemex relied exclusively on coal to heat its kilns; however, faced with soaring coal prices and shrinking profits, the company desperately needed a cheaper fuel. Cemex turned its attention to an oil industry waste product called *petroleum coke* that burns hotter than coal and costs half as much. The company spent about \$150 million to convert its kilns to burn petroleum coke. Overall, Cemex has cut its energy bills by 17%, helping it earn higher profit margins than its biggest rivals.

Source: John Lyons, "Expensive Energy? Burn Other Stuff, One Firm Decides," *The Wall Street Journal*, September 1, 2004, pp. A1 and A8.

YOU DECIDE**Writing Term Papers**

Assume your professors assigned four separate five-page papers that were all due on the same day. You turned in two complete papers and two incomplete papers—one of which was two pages long and the other was three pages long. Assuming that each page requires the same time and effort, how many complete papers could you have turned in with the same expenditure of time and effort?

COMPUTE AND APPLY COSTS**LEARNING OBJECTIVE 3**

Compute the cost per equivalent unit using the weighted-average method.

In the last section we computed the equivalent units of production for materials and for conversion at Double Diamond Skis. In this section we will compute the cost per equivalent unit for materials and for conversion. We will then use these costs to value ending work in process and finished goods inventories. Exhibit 4-7 displays all of the data concerning May's operations in the Shaping and Milling Department that we will need to complete these tasks.



EXHIBIT 4-7Shaping and Milling Department
Data for May Operations

Work in process, beginning:	
Units in process.....	200
Completion with respect to materials	55%
Completion with respect to conversion.....	30%
Costs in the beginning inventory:	
Materials cost.....	\$ 9,600
Conversion cost.....	5,575
Total cost in the beginning inventory.....	<u>\$ 15,175</u>
Units started into production during the period.....	5,000
Units completed and transferred out.....	4,800
Costs added to production during the period:	
Materials cost.....	\$368,600
Conversion cost.....	350,900
Total cost added in the department.....	<u>\$719,500</u>
Work in process, ending:	
Units in process.....	400
Stage of completion with respect to materials.....	40%
Stage of completion with respect to conversion.....	25%

Cost per Equivalent Unit—Weighted-Average Method

In the weighted-average method, the cost per equivalent unit is computed as follows:

Weighted-Average Method
(A Separate Calculation is Made for Each Cost Category in Each Processing Department)

$$\text{Cost per equivalent unit} = \frac{\text{Cost of beginning work in process inventory} + \text{Cost added during the period}}{\text{Equivalent units of production}}$$

Note that the numerator is the sum of the cost of beginning work in process inventory and of the cost added during the period. Thus, the weighted-average method blends together costs from the prior and current periods. That is why it is called the weighted-average method; it averages together units and costs from both the prior and current periods.

The costs per equivalent unit for materials and for conversion are computed below for the Shaping and Milling Department for May:

Shaping and Milling Department Costs per Equivalent Unit		
	Materials	Conversion
Cost of beginning work in process inventory	\$ 9,600	\$ 5,575
Costs added during the period.....	<u>368,600</u>	<u>350,900</u>
Total cost (a).....	<u>\$378,200</u>	<u>\$356,475</u>
Equivalent units of production (see the computations in the previous section) (b).....	4,960	4,900
Cost per equivalent unit (a) ÷ (b).....	\$76.25	\$72.75

LEARNING OBJECTIVE 4

Assign costs to units using the weighted-average method.



Applying Costs—Weighted-Average Method

The costs per equivalent unit are used to value units in ending inventory and units that are transferred to the next department. For example, each unit transferred out of Double Diamond's Shaping and Milling Department to the Graphics Application Department, as depicted in Exhibit 4-4, will carry with it a cost of \$149.00 (\$76.25 for materials cost and \$72.75 for conversion cost). Because 4,800 units were transferred out in May to the next department, the total cost assigned to those units would be \$715,200 (4,800 units \times \$149.00 per unit).

A complete accounting of the costs of both ending work in process inventory and the units transferred out appears below:

Shaping and Milling Department Costs of Ending Work in Process Inventory and the Units Transferred Out			
	Materials	Conversion	Total
Ending work in process inventory:			
Equivalent units of production (materials:			
400 units \times 40% complete; conversion:			
400 units \times 25% complete) (a).....			
	160	100	
Cost per equivalent unit (b)	\$76.25	\$72.75	
Cost of ending work in process inventory (a) \times (b)	\$12,200	\$7,275	\$19,475
Units completed and transferred out:			
Units transferred to the next department (a)	4,800	4,800	
Cost per equivalent unit (b)	\$76.25	\$72.75	
Cost of units transferred out (a) \times (b)	\$366,000	\$349,200	\$715,200

In each case, the equivalent units are multiplied by the cost per equivalent unit to determine the cost assigned to the units. This is done for each cost category—in this case, materials and conversion. The equivalent units for the units completed and transferred out are simply the number of units transferred to the next department because they would not have been transferred unless they were complete.

LEARNING OBJECTIVE 5

Prepare a cost reconciliation report.



Cost Reconciliation Report—Weighted-Average Method

The costs assigned to ending work in process inventory and to the units transferred out reconcile with the costs we started with in Exhibit 4-7 as shown below:

Shaping and Milling Department Cost Reconciliation	
Costs to be accounted for:	
Cost of beginning work in process inventory (Exhibit 4-7).....	\$ 15,175
Costs added to production during the period (Exhibit 4-7)	719,500
Total cost to be accounted for	<u>\$734,675</u>
Costs accounted for as follows:	
Cost of ending work in process inventory (see above).....	\$ 19,475
Cost of units transferred out (see above)	715,200
Total cost accounted for	<u>\$734,675</u>

The \$715,200 cost of the units transferred to the next department, Graphics Application, will be accounted for in that department as “costs transferred in.” It will be treated in the process costing system as just another category of costs like materials or conversion costs. The only difference is that the costs transferred in will always be 100% complete with respect to the work done in the Graphics Applications Department. Costs are passed on from one department to the next in this fashion, until they reach the last processing department, Finishing and Pairing. When the products are completed in this last department, their costs are transferred to finished goods.

1. Beginning work in process includes 400 units that are 20% complete with respect to conversion and 30% complete with respect to materials. Ending work in process includes 200 units that are 40% complete with respect to conversion and 50% complete with respect to materials. If 2,000 units were started during the period, what are the equivalent units of production for the period according to the weighted-average method?
 - a. Conversion equivalent units = 2,280 units; Material equivalent units = 2,100 units
 - b. Conversion equivalent units = 1,980 units; Material equivalent units = 2,080 units
 - c. Conversion equivalent units = 2,480 units; Material equivalent units = 1,980 units
 - d. Conversion equivalent units = 2,280 units; Material equivalent units = 2,300 units
2. Assume the same facts as above in Concept Check 1. Also, assume that \$9,900 of material costs and \$14,880 of conversion costs were in the beginning inventory and \$180,080 of materials and \$409,200 of conversion costs were added to production during the period. What is the total cost per equivalent unit using the weighted-average method?
 - a. \$268.60
 - b. \$267.85
 - c. \$280.00
 - d. \$265.00



SUMMARY

LO1 Record the flow of materials, labor, and overhead through a process costing system.

The journal entries to record the flow of costs in process costing are basically the same as in job-order costing. Direct materials costs are debited to Work in Process when the materials are released for use in production. Direct labor costs are debited to Work in Process as incurred. Manufacturing overhead costs are applied to Work in Process by debiting Work in Process. Costs are accumulated by department in process costing and by job in job-order costing.

LO2 Compute the equivalent units of production using the weighted-average method.

To compute unit costs for a department, the department’s output in terms of equivalent units must be determined. In the weighted-average method, the equivalent units for a period are the sum of the units transferred out of the department during the period and the equivalent units in ending work in process inventory at the end of the period.

LO3 Compute the cost per equivalent unit using the weighted-average method.

The cost per equivalent unit for a particular cost category in a department is computed by dividing the sum of the cost of beginning work in process inventory and the cost added during the period by the equivalent units of production for the period.

LO4 Assign costs to units using the weighted-average method.

The cost per equivalent unit is used to value units in ending inventory and units transferred to the next department. The cost assigned to ending inventory is determined by multiplying the cost per equivalent unit by the equivalent units in ending inventory. The cost assigned to the units transferred to the next department is determined by multiplying the cost per equivalent unit by the number of units transferred.

LO5 Prepare a cost reconciliation report.

The costs to be accounted for consist of beginning work in process inventory plus the cost added to work in process. These costs must equal the cost of ending work in process inventory plus the cost of the units transferred out.

GUIDANCE ANSWERS TO DECISION MAKER AND YOU DECIDE

Cost Analyst (p. 171)

The new production facility will convert a raw material (wood chips) into a homogeneous product (newsprint) produced in a continuous process. Therefore, a process costing system should be used.

Writing Term Papers (p. 178)

Each complete paper is five pages long and, by assumption, each page requires the same time and effort to write. Therefore, the time and effort that went into writing one incomplete two-page paper and one incomplete three-page paper could have been used to write one complete five-page paper. Added to the two complete papers that were turned in, this would have resulted in three complete papers.



GUIDANCE ANSWERS TO CONCEPT CHECKS

1. **Choice d.** Material equivalent units are 2,200 units completed and transferred to the next department + 100 equivalent units in ending work in process inventory (200 units × 50%). Conversion equivalent units are 2,200 units completed and transferred to the next department plus 80 equivalent units in ending work in process inventory (200 units × 40%).
2. **Choice a.** $(\$189,980 \div 2,300 \text{ equivalent units}) + (\$424,080 \div 2,280 \text{ equivalent units}) = \268.60 .

REVIEW PROBLEM: PROCESS COST FLOWS AND COSTING UNITS

Luxguard Home Paint Company produces exterior latex paint, which it sells in one-gallon containers. The company has two processing departments—Base Fab and Finishing. White paint, which is used as a base for all the company's paints, is mixed from raw ingredients in the Base Fab Department. Pigments are then added to the basic white paint, the pigmented paint is squirted under pressure into one-gallon containers, and the containers are labeled and packed for shipping in the Finishing Department. Information relating to the company's operations for April follows:

- a. Issued raw materials for use in production: Base Fab Department, \$851,000; and Finishing Department, \$629,000.
- b. Incurred direct labor costs: Base Fab Department, \$330,000; and Finishing Department, \$270,000.

- c. Applied manufacturing overhead cost: Base Fab Department, \$665,000; and Finishing Department, \$405,000.
- d. Transferred basic white paint from the Base Fab Department to the Finishing Department, \$1,850,000.
- e. Transferred paint that had been prepared for shipping from the Finishing Department to Finished Goods, \$3,200,000.

Required:

1. Prepare journal entries to record items (a) through (e) above.
2. Post the journal entries from (1) above to T-accounts. The balance in the Base Fab Department's Work in Process account on April 1 was \$150,000; the balance in the Finishing Department's Work in Process account was \$70,000. After posting entries to the T-accounts, find the ending balance in each department's Work in Process account.
3. Determine the cost of ending work in process inventories and of units transferred out of the Base Fab Department in April. The following additional information is available regarding production in the Base Fab Department during April:

Production data:

Units (gallons) in process, April 1: materials 100% complete, labor and overhead 60% complete.....	30,000
Units (gallons) started into production during April.....	420,000
Units (gallons) completed and transferred to the Finishing Department.....	370,000
Units (gallons) in process, April 30: materials 50% complete, labor and overhead 25% complete.....	80,000

Cost data:

Work in process inventory, April 1:	
Materials.....	\$ 92,000
Labor.....	21,000
Overhead.....	37,000
Total cost of work in process.....	<u>\$ 150,000</u>

Cost added during April:

Materials.....	\$ 851,000
Labor.....	330,000
Overhead.....	665,000
Total cost added during April.....	<u>\$1,846,000</u>

4. Prepare a cost reconciliation report for April.

Solution to Review Problem

I. a.	Work in Process—Base Fab Department.....	851,000	
	Work in Process—Finishing Department.....	629,000	
	Raw Materials.....		1,480,000
b.	Work in Process—Base Fab Department.....	330,000	
	Work in Process—Finishing Department.....	270,000	
	Salaries and Wages Payable.....		600,000
c.	Work in Process—Base Fab Department.....	665,000	
	Work in Process—Finishing Department.....	405,000	
	Manufacturing Overhead.....		1,070,000
d.	Work in Process—Finishing Department.....	1,850,000	
	Work in Process—Base Fab Department.....		1,850,000
e.	Finished Goods.....	3,200,000	
	Work in Process—Finishing Department.....		3,200,000

2.

Raw Materials			Salaries and Wages Payable		
Bal.	XXX	(a) 1,480,000		(b) 600,000	
Work in Process— Base Fab Department			Manufacturing Overhead		
Bal.	150,000	(d) 1,850,000	(Various actual costs)	(c) 1,070,000	
(a)	851,000				
(b)	330,000				
(c)	665,000				
Bal.	146,000				
Work in Process—Finishing Department			Finished Goods		
Bal.	70,000	(e) 3,200,000	Bal.	XXX	
(a)	629,000		(e)	3,200,000	
(b)	270,000				
(c)	405,000				
(d)	1,850,000				
Bal.	24,000				

3. First, we must compute the equivalent units of production for each cost category:

Base Fab Department Equivalent Units of Production			
	Materials	Labor	Overhead
Units transferred to the next department	370,000	370,000	370,000
Ending work in process inventory (materials: 80,000 units × 50% complete; labor: 80,000 units × 25% complete; overhead: 80,000 units × 25% complete).....	<u>40,000</u>	<u>20,000</u>	<u>20,000</u>
Equivalent units of production.....	<u>410,000</u>	<u>390,000</u>	<u>390,000</u>

Then we must compute the cost per equivalent unit for each cost category:

Base Fab Department Costs per Equivalent Unit			
	Materials	Labor	Overhead
Costs:			
Cost of beginning work in process inventory.....	\$ 92,000	\$ 21,000	\$ 37,000
Costs added during the period	<u>851,000</u>	<u>330,000</u>	<u>665,000</u>
Total cost (a)	<u>\$943,000</u>	<u>\$351,000</u>	<u>\$702,000</u>
Equivalent units of production (b)	410,000	390,000	390,000
Cost per equivalent unit (a) ÷ (b)	\$2.30	\$0.90	\$1.80

The costs per equivalent unit can then be applied to the units in ending work in process inventory and the units transferred out as follows:

Base Fab Department Costs of Ending Work in Process Inventory and the Units Transferred Out				
	Materials	Labor	Overhead	Total
Ending work in process inventory:				
Equivalent units of production	40,000	20,000	20,000	
Cost per equivalent unit.....	\$2.30	\$0.90	\$1.80	
Cost of ending work in process inventory.....	\$92,000	\$18,000	\$36,000	\$146,000
Units completed and transferred out:				
Units transferred to the next department.....	370,000	370,000	370,000	
Cost per equivalent unit.....	\$2.30	\$0.90	\$1.80	
Cost of units completed and transferred out ..	\$851,000	\$333,000	\$666,000	\$1,850,000

4.

Base Fab Department Cost Reconciliation	
Costs to be accounted for:	
Cost of beginning work in process inventory.....	\$ 150,000
Costs added to production during the period	1,846,000
Total cost to be accounted for	<u>\$1,996,000</u>
Costs accounted for as follows:	
Cost of ending work in process inventory.....	\$ 146,000
Cost of units transferred out.....	1,850,000
Total cost accounted for.....	<u>\$1,996,000</u>

GLOSSARY

- Conversion cost** Direct labor cost plus manufacturing overhead cost. (p. 177)
- Equivalent units** The product of the number of partially completed units and their percentage of completion with respect to a particular cost. Equivalent units are the number of complete whole units that could be obtained from the materials and effort contained in partially completed units. (p. 176)
- Equivalent units of production (weighted-average method)** The units transferred to the next department (or to finished goods) during the period plus the equivalent units in the department's ending work in process inventory. (p. 176)
- FIFO method** A process costing method in which equivalent units and unit costs relate only to work done during the current period. (p. 176)
- Process costing** A costing method used when essentially homogeneous products are produced on a continuous basis. (p. 170)
- Processing department** An organizational unit where work is performed on a product and where materials, labor, or overhead costs are added to the product. (p. 171)
- Weighted-average method** A process costing method that blends together units and costs from both the current and prior periods. (p. 176)

QUESTIONS

- 4-1 Under what conditions would it be appropriate to use a process costing system?
- 4-2 In what ways are job-order and process costing similar?
- 4-3 Why is cost accumulation simpler in a process costing system than it is in a job-order costing system?
- 4-4 How many Work in Process accounts are maintained in a company that uses process costing?

- 4-5 Assume that a company has two processing departments—Mixing and Firing. Prepare a journal entry to show a transfer of work in process from the Mixing Department to the Firing Department.
- 4-6 Assume that a company has two processing departments—Mixing followed by Firing. Explain what costs might be added to the Firing Department's Work in Process account during a period.
- 4-7 What is meant by the term *equivalent units of production* when the weighted-average method is used?
- 4-8 Watkins Trophies, Inc., produces thousands of medallions made of bronze, silver, and gold. The medallions are identical except for the materials used in their manufacture. What costing system would you advise the company to use?



Multiple choice questions are provided on the text website at www.mhhe.com/brewer5e.

BRIEF EXERCISES

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BRIEF EXERCISE 4-1 Process Costing Journal Entries [LO1]

Quality Brick Company produces bricks in two processing departments—Molding and Firing. Information relating to the company's operations in March follows:

- Raw materials were issued for use in production: Molding Department, \$23,000; and Firing Department, \$8,000.
- Direct labor costs were incurred: Molding Department, \$12,000; and Firing Department, \$7,000.
- Manufacturing overhead was applied: Molding Department, \$25,000; and Firing Department, \$37,000.
- Unfired, molded bricks were transferred from the Molding Department to the Firing Department. According to the company's process costing system, the cost of the unfired, molded bricks was \$57,000.
- Finished bricks were transferred from the Firing Department to the finished goods warehouse. According to the company's process costing system, the cost of the finished bricks was \$103,000.
- Finished bricks were sold to customers. According to the company's process costing system, the cost of the finished bricks sold was \$101,000.

Required:

Prepare journal entries to record items (a) through (f) above.

BRIEF EXERCISE 4-2 Computation of Equivalent Units—Weighted-Average Method [LO2]

Clonex Labs, Inc., uses a process costing system. The following data are available for one department for October:

	Units	Percent Completed	
		Materials	Conversion
Work in process, October 1	30,000	65%	30%
Work in process, October 31	15,000	80%	40%

The department started 175,000 units into production during the month and transferred 190,000 completed units to the next department.

Required:

Compute the equivalent units of production for October assuming that the company uses the weighted-average method of accounting for units and costs.

BRIEF EXERCISE 4-3 Cost per Equivalent Unit—Weighted-Average Method [LO3]

Superior Micro Products uses the weighted-average method in its process costing system. Data for the Assembly Department for May appear below:

	Materials	Labor	Overhead
Work in process, May 1	\$18,000	\$5,500	\$27,500
Cost added during May	\$238,900	\$80,300	\$401,500
Equivalent units of production	35,000	33,000	33,000

Required:

1. Compute the cost per equivalent unit for materials, for labor, and for overhead.
2. Compute the total cost per equivalent whole unit.

BRIEF EXERCISE 4-4 Applying Costs to Units—Weighted-Average Method [LO4]

Data concerning a recent period's activity in the Prep Department, the first processing department in a company that uses process costing, appear below:

	Materials	Conversion
Equivalent units of production in ending work in process	2,000	800
Cost per equivalent unit	\$13.86	\$4.43

A total of 20,100 units were completed and transferred to the next processing department during the period.

Required:

Compute the cost of the units transferred to the next department during the period and the cost of ending work in process inventory.

BRIEF EXERCISE 4-5 Cost Reconciliation Report—Weighted-Average Method [LO5]

Maria Am Corporation uses a process costing system. The Baking Department is one of the processing departments in its strudel manufacturing facility. In June in the Baking Department, the cost of beginning work in process inventory was \$3,570, the cost of ending work in process inventory was \$2,860, and the cost added to production was \$43,120.

Required:

Prepare a cost reconciliation report for the Baking Department for June.

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EXERCISES**EXERCISE 4-6 Process Costing Journal Entries [LO1]**

Chocolaterie de Geneve, SA, is located in a French-speaking canton in Switzerland. The company makes chocolate truffles that are sold in popular embossed tins. The company has two processing departments—Cooking and Molding. In the Cooking Department, the raw ingredients for the truffles are mixed and then cooked in special candy-making vats. In the Molding Department, the melted chocolate and other ingredients from the Cooking Department are carefully poured into molds and decorative flourishes are applied by hand. After cooling, the truffles are packed for sale. The company uses a process costing system. The T-accounts below show the flow of costs through the two departments in April (all amounts are in Swiss francs):

Work in Process—Cooking			
Balance 4/1	8,000	Transferred out	160,000
Direct materials	42,000		
Direct labor	50,000		
Overhead	75,000		
Work in Process—Molding			
Balance 4/1	4,000	Transferred out	240,000
Transferred in	160,000		
Direct labor	36,000		
Overhead	45,000		

Required:

Prepare journal entries showing the flow of costs through the two processing departments during April.

EXERCISE 4-7 Equivalent Units—Weighted-Average Method [LO2]

Hielta Oy, a Finnish company, processes wood pulp for various manufacturers of paper products. Data relating to tons of pulp processed during June are provided below:

	Tons of Pulp	Percent Completed	
		Materials	Labor and Overhead
Work in process, June 1	20,000	90%	80%
Work in process, June 30	30,000	60%	40%
Started into production during June	190,000		

Required:

1. Compute the number of tons of pulp completed and transferred out during June.
2. Compute the equivalent units of production for materials and for labor and overhead for June.

EXERCISE 4-8 Equivalent Units and Cost per Equivalent Unit—Weighted-Average Method [LO2, LO3]

Pureform, Inc., manufactures a product that passes through two departments. Data for a recent month for the first department follow:

	Units	Materials	Labor	Overhead
Work in process, beginning.....	5,000	\$4,320	\$1,040	\$1,790
Units started in process	45,000			
Units transferred out	42,000			
Work in process, ending	8,000			
Cost added during the month.....		\$52,800	\$21,500	\$32,250

The beginning work in process inventory was 80% complete with respect to materials and 60% complete with respect to labor and overhead. The ending work in process inventory was 75% complete with respect to materials and 50% complete with respect to labor and overhead.

Required:

Assume that the company uses the weighted-average method of accounting for units and costs.

1. Compute the equivalent units for the month for the first department.
2. Determine the costs per equivalent unit for the month.

EXERCISE 4-9 Equivalent Units and Cost per Equivalent Unit—Weighted-Average Method [LO2, LO3, LO4]

Helix Corporation produces prefabricated flooring in a series of steps carried out in production departments. All of the material that is used in the first production department is added at the beginning of processing in that department. Data for May for the first production department follow:

	Units	Percent Completed	
		Materials	Conversion
Work in process inventory, May 1	5,000	100%	40%
Work in process inventory, May 31	10,000	100%	30%
Materials cost in work in process inventory, May 1.....		\$1,500	
Conversion cost in work in process inventory, May 1		\$4,000	
Units started into production		180,000	
Units transferred to the next production department.....		175,000	
Materials cost added during May		\$54,000	
Conversion cost added during May		\$352,000	

Required:

1. Assume that the company uses the weighted-average method of accounting for units and costs. Determine the equivalent units for May for the first process.
2. Compute the costs per equivalent unit for May for the first process.
3. Determine the total cost of ending work in process inventory and the total cost of units transferred to the next process in May.

EXERCISE 4-10 Comprehensive Exercise; Second Production Department—Weighted-Average Method [LO2, LO3, LO4, LO5]

Scribners Corporation produces fine papers in three production departments—Pulping, Drying, and Finishing. In the Pulping Department, raw materials such as wood fiber and rag cotton are mechanically and chemically treated to separate their fibers. The result is a thick slurry of fibers. In the Drying Department, the wet fibers transferred from the Pulping Department are laid down on porous webs, pressed to remove excess liquid, and dried in ovens. In the Finishing Department, the dried paper is coated, cut, and spooled onto reels. The company uses the weighted-average method in its process costing system. Data for March for the Drying Department follow:

	Units	Percent Completed	
		Pulping	Conversion
Work in process inventory, March 1.....	5,000	100%	20%
Work in process inventory, March 31.....	8,000	100%	25%
Pulping cost in work in process inventory, March 1.....		\$4,800	
Conversion cost in work in process inventory, March 1.....		\$500	
Units transferred to the next production department.....		157,000	
Pulping cost added during March.....		\$102,450	
Conversion cost added during March.....		\$31,300	

No materials are added in the Drying Department. Pulping cost represents the costs of the wet fibers transferred in from the Pulping Department. Wet fiber is processed in the Drying Department in batches; each unit in the above table is a batch and one batch of wet fibers produces a set amount of dried paper that is passed on to the Finishing Department.

Required:

1. Determine the equivalent units for March for pulping and conversion.
2. Compute the costs per equivalent unit for March for pulping and conversion.
3. Determine the total cost of ending work in process inventory and the total cost of units transferred to the Finishing Department in March.
4. Prepare a cost reconciliation report for the Drying Department for March.

EXERCISE 4-11 Cost Assignment; Cost Reconciliation—Weighted-Average Method [LO2, LO4, LO5]

Superior Micro Products uses the weighted-average method in its process costing system. During January, the Delta Assembly Department completed its processing of 25,000 units and transferred them to the next department. The cost of beginning inventory and the costs added during January amounted to \$599,780 in total. The ending inventory in January consisted of 3,000 units, which were 80% complete with respect to materials and 60% complete with respect to labor and overhead. The costs per equivalent unit for the month were as follows:

	Materials	Labor	Overhead
Cost per equivalent unit.....	\$12.50	\$3.20	\$6.40

Required:

1. Compute the equivalent units of materials, labor, and overhead in the ending inventory for the month.
2. Compute the cost of ending inventory and of the units transferred to the next department for January.
3. Prepare a cost reconciliation for January. (Note: You will not be able to break the cost to be accounted for into the cost of beginning inventory and costs added during the month.)

EXERCISE 4-12 Equivalent Units—Weighted-Average Method [LO2]

Alaskan Fisheries, Inc., processes salmon for various distributors. Two departments are involved—Cleaning and Packing. Data relating to pounds of salmon processed in the Cleaning Department during July are presented below:

	Pounds of Salmon	Percent Completed	
		Materials	Labor and Overhead
Work in process, July 1	20,000	100%	30%
Work in process, July 31	25,000	100%	60%

A total of 380,000 pounds of salmon were started into processing during July. All materials are added at the beginning of processing in the Cleaning Department.

Required:

Compute the equivalent units for July for both materials and labor and overhead assuming that the company uses the weighted-average method of accounting for units.

PROBLEMS



Alternate problem set is available on the text website.

CHECK FIGURE

(3) Ending work in process: \$87,500

PROBLEM 4-13A Comprehensive Problem—Weighted-Average Method [LO2, LO3, LO4, LO5]

Sunspot Beverages, Ltd., of Fiji makes blended tropical fruit drinks in two stages. Fruit juices are extracted from fresh fruits and then blended in the Blending Department. The blended juices are then bottled and packed for shipping in the Bottling Department. The following information pertains to the operations of the Blending Department for June. (The currency in Fiji is the Fijian dollar.)

	A	B	C	D
1			<i>Percent Completed</i>	
2		<i>Units</i>	<i>Materials</i>	<i>Conversion</i>
3	Work in process, beginning	20,000	100%	75%
4	Started into production	180,000		
5	Completed and transferred out	160,000		
6	Work in process, ending	40,000	100%	25%
7				
8			<i>Materials</i>	<i>Conversion</i>
9	Work in process, beginning		\$25,200	\$24,800
10	Cost added during June		\$334,800	\$238,700
11				
12				

Required:

Assume that the company uses the weighted-average method.

- Determine the equivalent units for June for the Blending Department.
- Compute the costs per equivalent unit for the Blending Department.
- Determine the total cost of ending work in process inventory and the total cost of units transferred to the Bottling Department.
- Prepare a cost reconciliation report for the Blending Department for June.

CHECK FIGURE

(3) Ending work in process: \$16,500

PROBLEM 4-14A Comprehensive Problem—Weighted-Average Method [LO2, LO3, LO4, LO5]

Builder Products, Inc., manufactures a caulking compound that goes through three processing stages prior to completion. Information on work in the first department, Cooking, for May follows:



Production data:	
Pounds in process, May 1; materials 100% complete; conversion 80% complete.....	10,000
Pounds started into production during May.....	100,000
Pounds completed and transferred out.....	?
Pounds in process, May 31; materials 60% complete; conversion 20% complete.....	15,000
Cost data:	
Work in process inventory, May 1:	
Materials cost.....	\$1,500
Conversion cost.....	\$7,200
Cost added during May:	
Materials cost.....	\$154,500
Conversion cost.....	\$90,800

The company uses the weighted-average method.

Required:

1. Compute the equivalent units of production.
2. Compute the costs per equivalent unit for the month.
3. Determine the cost of ending work in process inventory and of the units transferred out to the next department.
4. Prepare a cost reconciliation report for the month.

PROBLEM 4-15A Comprehensive Problem; Second Production Department—Weighted-Average Method [LO2, LO3, LO4, LO5]

Old Country Links Inc. produces sausages in three production departments—Mixing, Casing and Curing, and Packaging. In the Mixing Department, meats are prepared and ground and then mixed with spices. The spiced meat mixture is then transferred to the Casing and Curing Department, where the mixture is force-fed into casings and then hung and cured in climate-controlled smoking chambers. In the Packaging Department, the cured sausages are sorted, packed, and labeled. The company uses the weighted-average method in its process costing system. Data for September for the Casing and Curing Department follow:

CHECK FIGURE
(3) Ending work in process: \$2,321



	Units	Percent Completed		
		Mixing	Materials	Conversion
Work in process inventory, September 1	1	100%	90%	80%
Work in process inventory, September 30.....	1	100%	80%	70%

	Mixing	Materials	Conversion
Work in process inventory, September 1	\$1,670	\$90	\$605
Cost added during September.....	\$81,460	\$6,006	\$42,490

Mixing cost represents the costs of the spiced meat mixture transferred in from the Mixing Department. The spiced meat mixture is processed in the Casing and Curing Department in batches; each unit in the above table is a batch and one batch of spiced meat mixture produces a set amount of sausages that are passed on to the Packaging Department. During September, 50 batches (i.e., units) were completed and transferred to the Packaging Department.

Required:

1. Determine the equivalent units for September for mixing, materials, and conversion. Do not round off your computations.
2. Compute the costs per equivalent unit for September for mixing, materials, and conversion.

- Post the journal entries from (1) above to T-accounts. The following account balances existed at the beginning of March. (The beginning balance in the Refining Department’s Work in Process account is given on the prior page.)

Raw Materials	\$618,000
Work in Process—Blending Department	\$65,000
Finished Goods.....	\$20,000

After posting the entries to the T-accounts, find the ending balance in the inventory accounts and the manufacturing overhead account.

BUILDING YOUR SKILLS

CHECK FIGURE

- Ending work in process: \$7,182

excel



ANALYTICAL THINKING [LO2, LO3, LO4]

“I think we goofed when we hired that new assistant controller,” said Ruth Scarpino, president of Provost Industries. “Just look at this report that he prepared for last month for the Finishing Department. I can’t make heads or tails out of it.”

Finishing Department costs:	
Work in process inventory, April 1, 450 units; materials 100% complete; conversion 60% complete.....	\$ 8,208*
Costs transferred in during the month from the preceding department, 1,950 units	17,940
Materials cost added during the month	6,210
Conversion costs incurred during the month.....	<u>13,920</u>
Total departmental costs	<u>\$46,278</u>
Finishing Department costs assigned to:	
Units completed and transferred to finished goods, 1,800 units at \$25.71 per unit	\$46,278
Work in process inventory, April 30, 600 units; materials 0% complete; conversion 35% complete.....	<u>0</u>
Total departmental costs assigned.....	<u>\$46,278</u>

*Consists of cost transferred in, \$4,068; materials cost, \$1,980; and conversion cost, \$2,160.

“He’s struggling to learn our system,” replied Frank Harrop, the operations manager. “The problem is that he’s been away from process costing for a long time, and it’s coming back slowly.”

“It’s not just the format of his report that I’m concerned about. Look at that \$25.71 unit cost that he’s come up with for April. Doesn’t that seem high to you?” said Ms. Scarpino.

“Yes, it does seem high; but on the other hand, I know we had an increase in materials prices during April, and that may be the explanation,” replied Mr. Harrop. “I’ll get someone else to redo this report and then we may be able to see what’s going on.”

Provost Industries manufactures a ceramic product that goes through two processing departments—Molding and Finishing. The company uses the weighted-average method in its process costing.

Required:

- Prepare a report for the Finishing Department showing how much cost should have been assigned to the units completed and transferred to finished goods, and how much cost should have been assigned to ending work in process inventory in the Finishing Department.
- Explain to the president why the unit cost on the new assistant controller’s report is so high.

ETHICS CASE [LO2, LO3, LO4]

Gary Stevens and Mary James are production managers in the Consumer Electronics Division of General Electronics Company, which has several dozen plants scattered in locations throughout the world. Mary manages the plant located in Des Moines, Iowa, while Gary manages the plant in El Segundo, California. Production managers are paid a salary and get an additional bonus equal to 5% of their base salary if the entire division meets or exceeds its target profits for the year. The bonus is determined in March after the company's annual report has been prepared and issued to stockholders.

Shortly after the beginning of the new year, Mary received a phone call from Gary that went like this:

Gary: How's it going, Mary?

Mary: Fine, Gary. How's it going with you?

Gary: Great! I just got the preliminary profit figures for the division for last year and we are within \$200,000 of making the year's target profits. All we have to do is pull a few strings, and we'll be over the top!

Mary: What do you mean?

Gary: Well, one thing that would be easy to change is your estimate of the percentage completion of your ending work in process inventories.

Mary: I don't know if I can do that, Gary. Those percentage completion figures are supplied by Tom Winthrop, my lead supervisor, who I have always trusted to provide us with good estimates. Besides, I have already sent the percentage completion figures to corporate headquarters.

Gary: You can always tell them there was a mistake. Think about it, Mary. All of us managers are doing as much as we can to pull this bonus out of the hat. You may not want the bonus check, but the rest of us sure could use it.

The final processing department in Mary's production facility began the year with no work in process inventories. During the year, 210,000 units were transferred in from the prior processing department and 200,000 units were completed and sold. Costs transferred in from the prior department totaled \$39,375,000. No materials are added in the final processing department. A total of \$20,807,500 of conversion cost was incurred in the final processing department during the year.

Required:

1. Tom Winthrop estimated that the units in ending inventory in the final processing department were 30% complete with respect to the conversion costs of the final processing department. If this estimate of the percentage completion is used, what would be the Cost of Goods Sold for the year?
2. Does Gary Stevens want the estimated percentage completion to be increased or decreased? Explain why.
3. What percentage completion would result in increasing reported net operating income by \$200,000 over the net operating income that would be reported if the 30% figure were used?
4. Do you think Mary James should go along with the request to alter estimates of the percentage completion? Why or why not?

CHECK FIGURE

(3) 50% completion



5

Cost Behavior: Analysis and Use

<< A LOOK BACK

We provided overviews of the systems that are used to accumulate product costs in Chapters 2 (job-order costing), 3 (activity-based costing), and 4 (process costing).

A LOOK AT THIS CHAPTER

After reviewing the behavior of variable and fixed costs, in Chapter 5 we discuss mixed costs, which are a combination of variable and fixed costs, and describe the methods that can be used to break a mixed cost into its variable and fixed components. We also introduce the contribution format income statement, which is designed to aid decision making. In the appendix, we compare variable costing and absorption costing net operating incomes.

A LOOK AHEAD >>

Chapter 6 describes the basics of cost-volume-profit analysis, a tool that helps managers understand the interrelationships among cost, volume, and profit.

CHAPTER OUTLINE

Types of Cost Behavior Patterns

- Variable Costs
- True Variable versus Step-Variable Costs
- Fixed Costs
- Types of Fixed Costs
- Fixed Costs and the Relevant Range
- Mixed Costs

The Analysis of Mixed Costs

- Diagnosing Cost Behavior with a Scattergraph Plot
- The High-Low Method
- The Least-Squares Regression Method
- Multiple Regression Analysis

The Contribution Format Income Statement

- Why a New Income Statement Format?
- The Contribution Approach

Appendix 5A: Variable Costing

- Overview of Absorption and Variable Costing
- Reconciliation of Variable Costing with Absorption Costing Income



DECISION FEATURE

The Business of Art Sculpture

Shidoni Foundry, located in Tesuque, New Mexico, is a fine art casting and fabrication facility. The process of creating a bronze or other metal sculpture is complex. The artist creates the sculpture using modeling clay. The artist then hires a foundry such as Shidoni to produce the actual metal sculpture. Shidoni craftspeople make a rubber mold from the clay model then use that mold to make a wax version of the original. The wax is in turn used to make a ceramic casting mold and then finally the bronze version is cast. Both the wax and the ceramic casting mold are destroyed in the process of making the metal casting, but the rubber mold is not and can be reused to make additional castings.

The surface of the metal sculpture can be treated with various patinas. One of the accompanying photos shows Harry Gold, the shop's patina artist, applying a patina to a metal sculpture with brush and blowtorch. The other photo shows a finished sculpture with patinas applied.

The artist is faced with a difficult business decision. The rubber mold for a small figure such as the seated Indian in the accompanying photo costs roughly \$500; the mold for a life-size figure such as the cowboy costs \$3,800 to \$5,000. This is just for the mold! Fortunately, as discussed above, a number of metal castings can be made from each mold. However, each life-size casting costs \$8,500 to \$11,000. In contrast, a casting of the much smaller Indian sculpture would cost about \$750. Given the fixed costs of the mold and variable costs of the casting, finish treatments, and bases, the artist must decide how many castings to produce and how to price them. The fewer the castings, the greater the rarity factor, and hence the higher the price that can be charged to art lovers. However, in that case, the fixed costs of making the mold must be spread across fewer items. The artist must make sure not to price the sculptures so high that the investment in molds and in the castings cannot be recovered.

Source: Conversations with Shidoni personnel, including Bill Rogers and Harry Gold, and Shidoni literature. See www.shidoni.com for more information concerning the company.

LEARNING OBJECTIVES



After studying Chapter 5, you should be able to:

LO1 Understand how fixed and variable costs behave and how to use them to predict costs.

LO2 Use a scattergraph plot to diagnose cost behavior.

LO3 Analyze a mixed cost using the high-low method.

LO4 Prepare an income statement using the contribution format.

LO5 (Appendix 5A) Explain how variable costing differs from absorption costing and compute unit product costs under each method.

LO6 (Appendix 5A) Prepare income statements using both variable and absorption costing.

LO7 (Appendix 5A) Reconcile variable costing and absorption costing net operating incomes and explain why the two amounts differ.

In Chapter 1, we stated that costs can be classified by behavior. Cost behavior refers to how a cost will change as the level of activity changes. Managers who understand how costs behave can predict how costs will change under various alternatives. Conversely, attempting to make decisions without a thorough understanding of cost behavior patterns can lead to disaster. For example, cutting back production of a product line might result in far less cost savings than managers assume if they confuse fixed costs with variable costs. To avoid such problems, managers must be able to accurately predict what costs will be at various activity levels.

This chapter briefly reviews the definitions of variable and fixed costs and then discusses the behavior of these costs in greater depth than in Chapter 1. The chapter also introduces the concept of a mixed cost, which is a cost that has both variable and fixed cost elements. The chapter concludes by introducing a new income statement format—called the *contribution format*—in which costs are organized by their behavior rather than by the traditional functions of production, sales, and administration.

TYPES OF COST BEHAVIOR PATTERNS

In Chapter 1 we mentioned only variable and fixed costs. In this chapter we will examine a third cost behavior pattern, known as a *mixed* or *semivariable cost*. All three cost behavior patterns—variable, fixed, and mixed—are found in most organizations. The relative proportion of each type of cost in an organization is known as its **cost structure**. For example, an organization might have many fixed costs but few variable or mixed costs. Alternatively, it might have many variable costs but few fixed or mixed costs. In this chapter, we will concentrate on gaining a fuller understanding of the behavior of each type of cost. In the next chapter, we explore how cost structure impacts decisions.

IN BUSINESS

Cost Structure: A Management Choice



Some managers are thriftier than others. Kenneth Iverson built **Nucor Steel** into the most successful U.S. steel company of recent years by developing a whole new approach to steel-making using cost-efficient minimills. Iverson ran his company with few layers of management and a commitment to employees that everyone would be treated alike. Workers were “dissuaded from joining a union by high wages and a series of No’s—no management dining rooms, no company yachts, no company planes, no first-class travel for executives, and no support staff to pamper the upper echelons.” Iverson ran the largest steel company in the U.S. with only 20 people in his headquarters. “By responding to market signals, focusing on a single major product line, and treating his employees with respect and compassion, Mr. Iverson contributed immensely to the industrial rebirth in this country.”

Source: Donald F. Barnett and Robert W. Crandall, “Remembering a Man of Steel,” *The Wall Street Journal*, April 23, 2002, p. B4.

LEARNING OBJECTIVE 1

Understand how fixed and variable costs behave and how to use them to predict costs.

Variable Costs

We explained in Chapter 1 that a variable cost is a cost whose total dollar amount varies in direct proportion to changes in the activity level. If the activity level doubles, the total variable cost also doubles. If the activity level increases by only 10%, then the total variable cost increases by 10% as well.

Advertising on the Web

IN BUSINESS

Many companies spend a growing portion of their advertising budgets on web-based contextual advertising. Here is an example of how it works. A tour company specializing in trips to Belize partners with **National Geographic** and **Quigo Technologies**, a software company, to ensure that every time a visitor reads a National Geographic article mentioning the word Belize, a pop-up advertisement contains a link to the tour company's website. The tour company pays 50 cents each time a visitor clicks on that link. The 50 cents is split between **iExplore.com**, National Geographic's on-line business, and Quigo Technologies. For the tour company, this form of advertising is a clear example of a variable cost. The cost per click is constant at 50 cents per unit, but the total advertising cost rises as the number of clicks increases.

The challenge for software developers at companies such as Quigo Technologies, **Google**, and **Yahoo** is to write programs that intelligently select ads that are relevant to the context of a given web page. Providing superior contextual relevance increases the likelihood that web surfers will click on an advertisement, which in turn increases the revenue generated. Quigo Technologies' Michael Yavonditte claims that his company's ads are clicked on 0.7% of the time versus 0.2% for competitors.

Source: Chana R. Schoenberger, "Out of Context" *Forbes*, November 29, 2004, pp. 64–68.

We also found in Chapter 1 that a variable cost remains constant if expressed on a *per unit* basis. To provide an example, consider Nooksack Expeditions, a small company that provides daylong whitewater rafting excursions on rivers in the North Cascade Mountains. The company provides all of the necessary equipment and experienced guides, and it serves gourmet meals to its guests. The meals are purchased from a caterer for \$30 a person for a daylong excursion. If we look at the cost of the meals on a *per person* basis, it remains constant at \$30. This \$30 cost per person will not change, regardless of how many people participate in a daylong excursion. The behavior of this variable cost, on both a per unit and a total basis, is tabulated as follows:

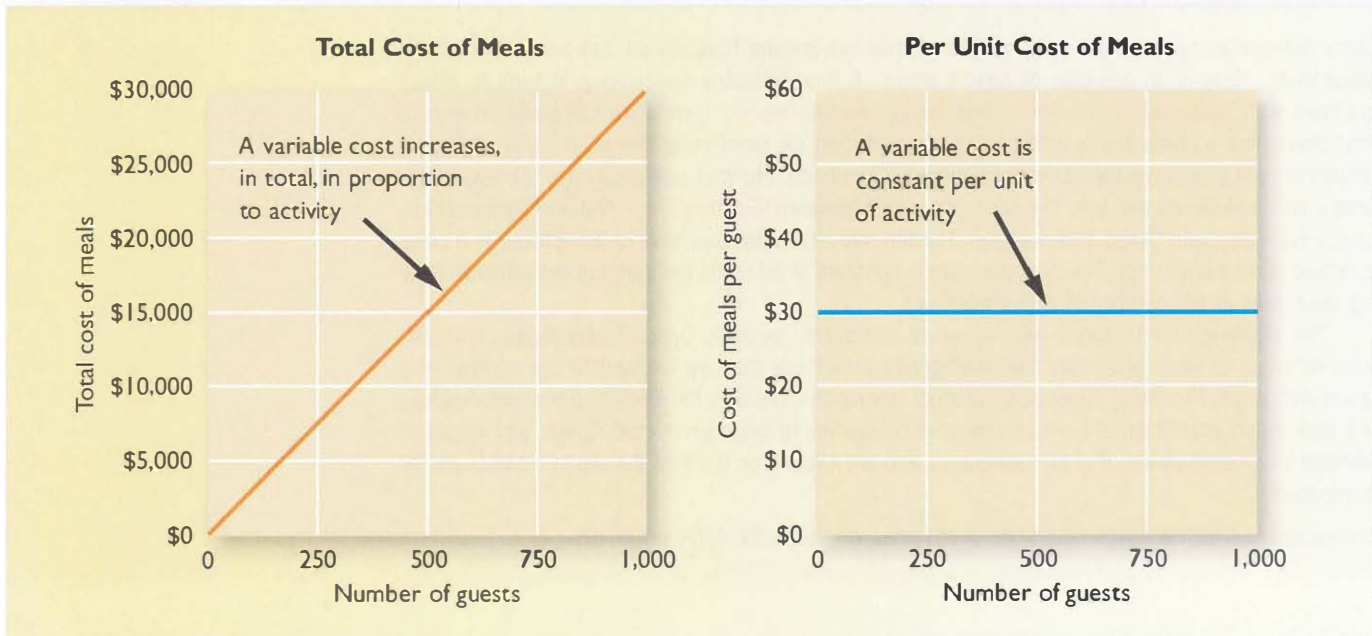


Number of Guests	Cost of Meals per Guest	Total Cost of Meals
250.....	\$30	\$7,500
500.....	\$30	\$15,000
750.....	\$30	\$22,500
1,000.....	\$30	\$30,000

The idea that a variable cost is constant per unit but varies in total with the activity level is crucial to understanding cost behavior patterns. We shall rely on this concept repeatedly in this chapter and in chapters ahead.

Exhibit 5–1 illustrates variable cost behavior. Note that the graph of the total cost of the meals slants upward to the right. This is because the total cost of the meals is directly proportional to the number of guests. In contrast, the graph of the per unit cost of meals is flat because the cost of the meals per guest is constant at \$30.

The Activity Base For a cost to be variable, it must be variable *with respect to something*. That “something” is its *activity base*. An **activity base** is a measure of whatever causes the incurrence of variable cost. An activity base is sometimes referred to as a *cost driver*. Some of the most common activity bases are direct labor-hours, machine-hours, units produced, and units sold. Other examples of activity bases (cost drivers) include the number of miles driven by salespersons, the number of pounds of laundry

EXHIBIT 5-1 Variable Cost Behavior

cleaned by a hotel, the number of calls handled by technical support staff at a software company, and the number of beds occupied in a hospital.

People sometimes get the notion that if a cost doesn't vary with production or with sales, then it is not a variable cost. This is not correct. As suggested by the range of bases listed above, costs are caused by many different activities within an organization. Whether a cost is variable or fixed depends on whether it is caused by the activity under consideration. For example, when analyzing the cost of service calls under a product warranty, the relevant activity measure is the number of service calls made. Those costs that vary in total with the number of service calls made are the variable costs of making service calls.

Nevertheless, unless stated otherwise, you can assume that the activity base under consideration is the total volume of goods and services provided by the organization. So, for example, if we ask whether direct materials at **Ford** is a variable cost, the answer is yes because the cost of direct materials is variable with respect to Ford's total volume of output. We will specify the activity base only when it is something other than total output.

Extent of Variable Costs The number and type of variable costs in an organization will depend in large part on the organization's structure and purpose. A public utility like **Florida Power and Light**, with large investments in equipment, will tend to have few variable costs. Most of the costs are associated with its plant, and these costs tend to be insensitive to changes in levels of service provided. A manufacturing company like **Black and Decker**, by contrast, will often have many variable costs; these costs will be associated with both manufacturing and distributing its products to customers.

A merchandising company like **Wal-Mart** or **J. K. Gill** will usually have a high proportion of variable costs in its cost structure. In most merchandising companies, the cost of merchandise purchased for resale, a variable cost, constitutes a very large component of total cost. Service companies, by contrast, have diverse cost structures. Some service companies, such as the **Skippers** restaurant chain, have fairly large variable costs because of the costs of their raw materials. On the other hand, service companies involved in consulting, auditing, engineering, dental, medical, and architectural activities have very large fixed costs in the form of expensive facilities and highly trained salaried employees.

EXHIBIT 5-2
Examples of Variable Costs

Type of Organization	Costs That Are Normally Variable with Respect to Volume of Output
Merchandising company	Cost of goods (merchandise) sold
Manufacturing company	Direct materials Direct labor* Variable elements of manufacturing overhead: Indirect materials Lubricants Supplies Power
Both merchandising and manufacturing companies	Variable elements of selling and administrative costs: Commissions Shipping costs
Service organizations	Supplies

*Direct labor may or may not be variable in practice. See the discussion later in this chapter.

Some of the more frequently encountered variable costs are listed in Exhibit 5-2 above. This exhibit is not a complete listing of all costs that can be considered variable. Moreover, some of the costs listed in the exhibit may behave more like fixed than variable costs in some organizations and in some circumstances. We will see examples of this later in the chapter. Nevertheless, Exhibit 5-2 provides a useful listing of many of the costs that normally would be considered variable with respect to the volume of output.

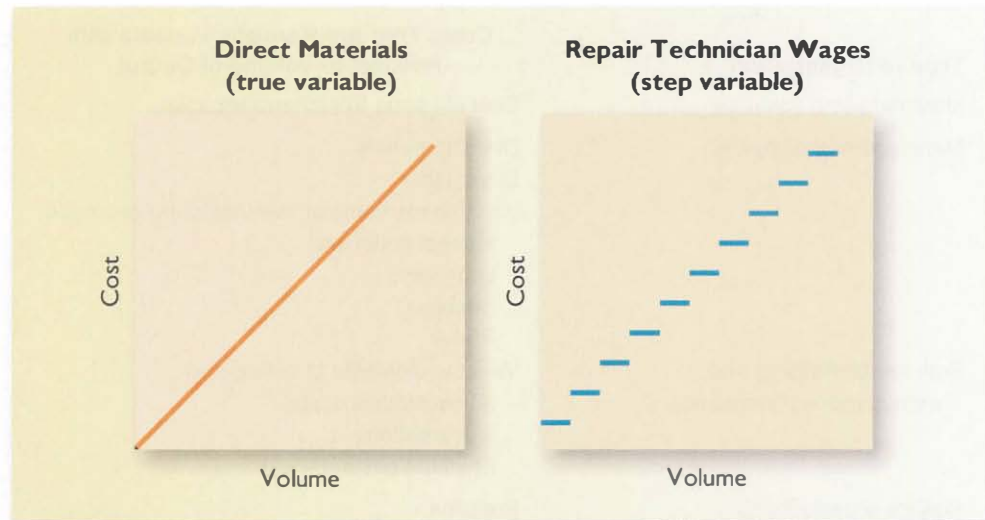
True Variable versus Step-Variable Costs

Not all variable costs have exactly the same behavior pattern. Some variable costs behave in a *true variable or proportionately variable* pattern. Other variable costs behave in a *step-variable* pattern.

True Variable Costs Direct materials is a true or proportionately variable cost because the amount used during a period will vary in direct proportion to the level of production activity. Moreover, any amounts purchased but not used can be stored and carried forward to the next period as inventory.

Step-Variable Costs The cost of a resource that is obtained in large chunks and that increases or decreases only in response to fairly wide changes in activity is known as a **step-variable cost**. For example, the wages of skilled repair technicians are often considered to be a step-variable cost. Such a technician's time can only be obtained in large chunks—it is difficult to hire a skilled technician on anything other than a full-time basis. Moreover, any technician's time not currently used cannot be stored as inventory and carried forward to the next period. If the time is not used effectively, it is gone forever. Furthermore, a repair technician can work at a leisurely pace if pressures are light but intensify his or her efforts if pressures build up. For this reason, small changes in the level of production may have no effect on the number of technicians employed by the company.

Exhibit 5-3 contrasts the behavior of a step-variable cost with the behavior of a true variable cost. Notice that the cost of repair technicians changes only with fairly wide changes in volume and that additional technicians come in large, indivisible chunks. Great care must be taken in working with these kinds of costs to prevent "fat" from building up in an organization. There may be a tendency to employ additional help more quickly than needed, and there is a natural reluctance to lay people off when volume declines.

EXHIBIT 5-3True Variable versus
Step-Variable Costs**IN BUSINESS****How Many Guides?**

Majestic Ocean Kayaking, of Ucluelet, British Columbia, is owned and operated by Tracy Morben-Eeftink. The company offers a number of guided kayaking excursions ranging from three-hour tours of the Ucluelet harbor to six-day kayaking and camping trips in Clayoquot Sound. One of the company's excursions is a four-day kayaking and camping trip to The Broken Group Islands in the Pacific Rim National Park. Special regulations apply to trips in the park—including a requirement that one certified guide must be assigned for every five guests or fraction thereof. For example, a trip with 12 guests must have at least three certified guides. Guides are not salaried and are paid on a per-day basis. Therefore, the cost to the company of the guides for a trip is a step-variable cost rather than a fixed cost or a strictly variable cost. One guide is needed for 1 to 5 guests, two guides for 6 to 10 guests, three guides for 11 to 15 guests, and so on.

Sources: Tracy Morben-Eeftink, owner, Majestic Ocean Kayaking. For more information about the company, see www.oceankayaking.com.

IN BUSINESS**What Goes Up Doesn't Necessarily Come Down**

The traditional view of variable costs is that they behave similarly in response to either increases or decreases in activity. However, the results of a research study using data from 7,629 companies spanning a 20-year period suggests otherwise. In this study, a 1% increase in sales corresponded with a 0.55% increase in selling and administrative costs, while a 1% decrease in sales corresponded with a 0.35% decrease in selling and administrative costs. These results suggest that many costs do not mechanically increase or decrease in response to changes in the activity base; rather they change in response to managers' decisions about how to react to changes in the level of the activity base.

"When volume falls, managers must decide whether to maintain committed resources and bear the costs of operating with unutilized capacity or reduce committed resources and incur the adjustment costs of retrenching and, if volume is restored, replacing committed resources at a later date." Managers faced with these choices are less likely to reduce expenses when they perceive that a decrease in activity level is temporary or when the cost of adjusting committed resources is high.

Source: Mark C. Anderson, Rajiv D. Banker, and Surya N. Janakiraman, "Are Selling, General, and Administrative Costs 'Sticky?'" *Journal of Accounting Research*, March 2003, pp. 47–63.

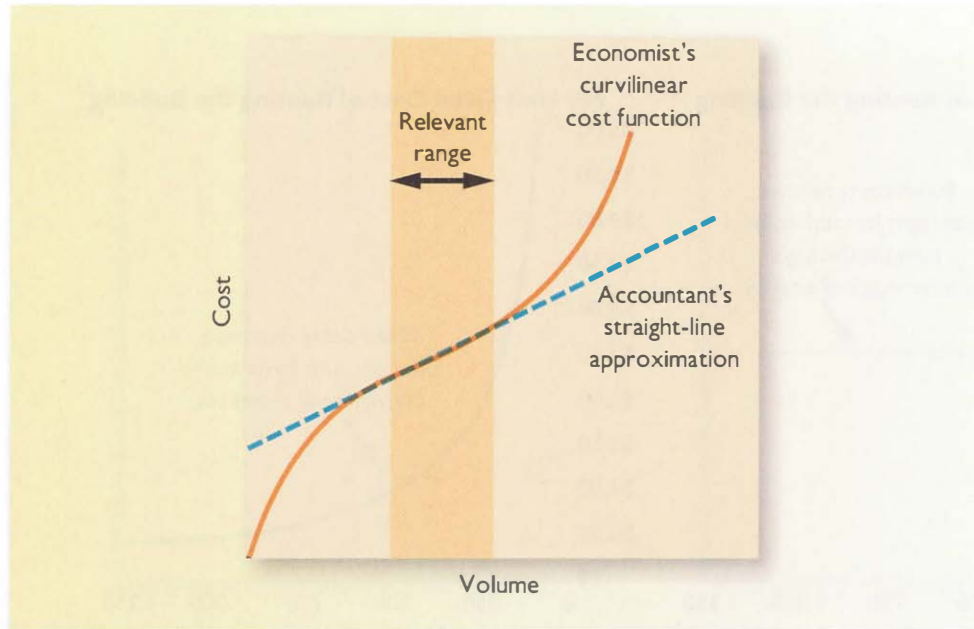


EXHIBIT 5-4
Curvilinear Costs and the Relevant Range

The Linearity Assumption and the Relevant Range Except in the case of step-variable costs, we ordinarily assume a strictly linear relationship between cost and volume. Economists correctly point out that many costs that the accountant classifies as variable actually behave in a *curvilinear* fashion; that is, the relation between cost and activity is a curve. A curvilinear cost is illustrated in Exhibit 5-4.

Although many costs are not strictly linear, a curvilinear cost can be satisfactorily approximated with a straight line within a narrow band of activity known as the *relevant range*. The **relevant range** is that range of activity within which the assumptions made about cost behavior are reasonably valid. For example, note that the dashed line in Exhibit 5-4 approximates the curvilinear cost with very little loss of accuracy within the shaded relevant range. However, outside of the relevant range this particular straight line is a poor approximation to the curvilinear cost relationship. Managers should always keep in mind that assumptions made about cost behavior may be invalid if activity falls outside of the relevant range.

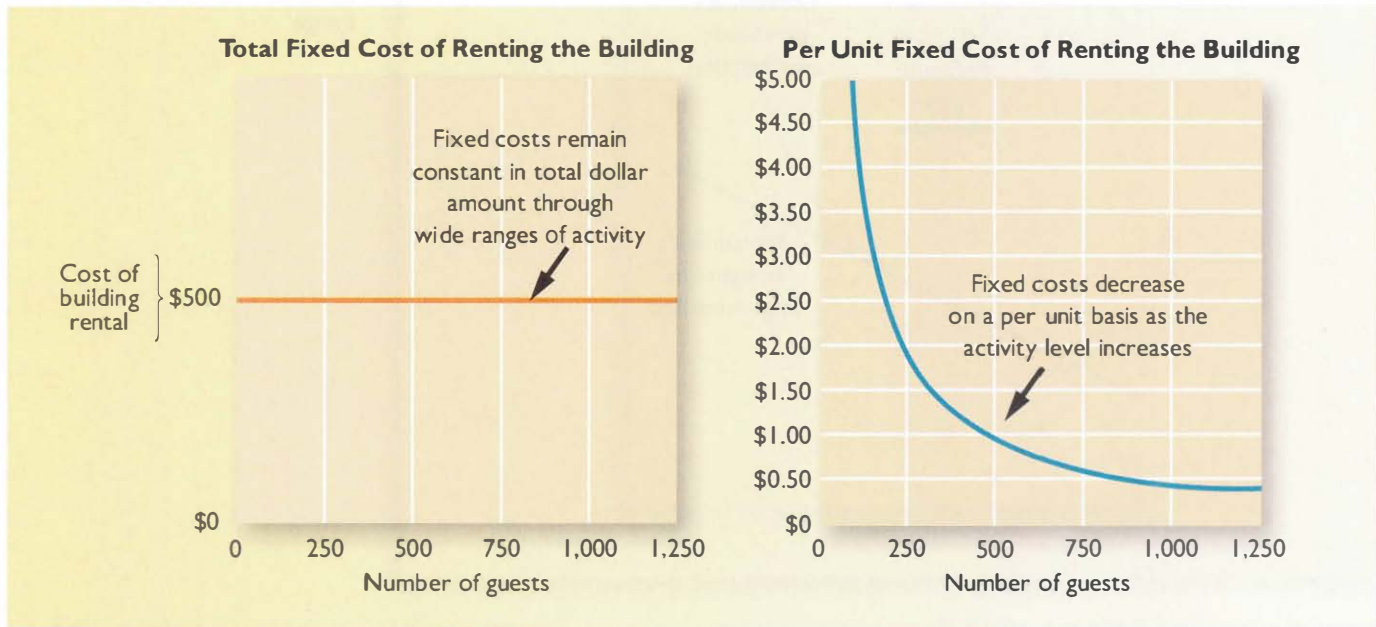
Fixed Costs

In our discussion of cost behavior patterns in Chapter 1, we stated that total fixed costs remain constant within the relevant range of activity. To continue the Nooksack Expeditions example, assume the company rents a building for \$500 per month to store its equipment. Within the relevant range, the total amount of rent paid is the same regardless of the number of guests the company takes on its expeditions during any given month. Exhibit 5-5 depicts this cost behavior pattern.

Because fixed costs remain constant in total, the average fixed cost *per unit* becomes progressively smaller as the level of activity increases. If Nooksack Expeditions has only 250 guests in a month, the \$500 fixed rental cost would amount to an average of \$2 per guest. If there are 1,000 guests, the fixed rental cost would average only 50 cents per guest. Exhibit 5-5 illustrates this aspect of the behavior of fixed costs. Note that as the number of guests increases, the average fixed cost per unit drops, but it drops at a decreasing rate. The first guests have the biggest impact on the average fixed cost per unit.

It is necessary in some contexts to express fixed costs on an average per unit basis. For example, in Chapter 1 we showed how unit product costs computed for use in external financial statements contain both variable and fixed costs. As a general rule, however, we caution against expressing fixed costs on an average per unit basis in internal reports

EXHIBIT 5-5 Fixed Cost Behavior



IN BUSINESS

Costing the Trek

Jackson Hole Llamas is owned and operated by Jill Aanonsen/Hodges and David Hodges. The company provides guided tours to remote areas of Yellowstone National Park and the Jedediah Smith Wilderness, with the llamas carrying the baggage for the multiday treks.

Jill and David operate out of their ranch in Jackson Hole, Wyoming, leading about 10 trips each summer season. All food is provided as well as tents and sleeping pads. Based on the number of guests on a trip, Jill and David will decide how many llamas will go on the trip and how many will remain on the ranch. Llamas are transported to the trailhead in a special trailer.

The company has a number of costs, some of which are listed below:



Cost	Cost Behavior
Food and beverage costs	Variable with respect to the number of guests and the length of the trip in days.
Truck and trailer operating costs	Variable with respect to the number of miles to the trailhead.
Guide wages	Step variable; Jill and David serve as the guides on most trips and hire guides only for larger groups.
Costs of providing tents	Variable with respect to the number of guests and length of the trip in days. Jackson Hole Llamas owns its tents, but they wear out through use and must be repaired or eventually replaced.
Cost of feeding llamas	Variable with respect to the number of guests, and hence the number of llamas, on a trip. [Actually, the cost of feeding llamas may decrease with the number of guests on a trip. When a llama is on a trek, it lives off the land—eating grasses and other vegetation found in meadows and along the trail. When a llama is left on the ranch, it may have to be fed purchased feed.]
Property taxes	Fixed.

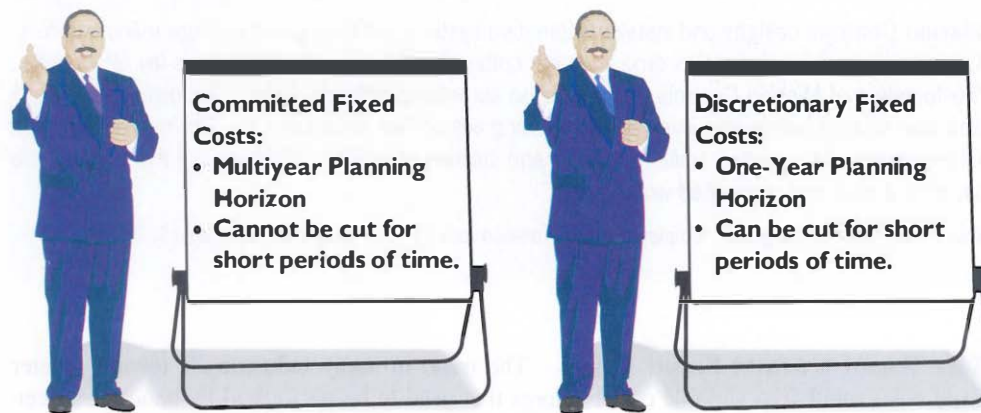
Source: Jill Aanonsen/Hodges and David Hodges, owners and operators of Jackson Hole Llamas, www.jhllamas.com.

because it creates the false impression that fixed costs are like variable costs and that total fixed costs actually change as the level of activity changes. To avoid confusion in internal reporting and decision-making situations, fixed costs should be expressed in total rather than on a per unit basis.

Types of Fixed Costs

Fixed costs are sometimes referred to as capacity costs because they result from outlays made for buildings, equipment, skilled professional employees, and other items needed to provide the basic capacity for sustained operations. For planning purposes, fixed costs can be viewed as either *committed* or *discretionary*.

Committed vs. Discretionary Fixed Costs



Committed Fixed Costs Investments in facilities, equipment, and the basic organization often can't be significantly reduced even for short periods of time without making fundamental changes. Such costs are referred to as **committed fixed costs**. Examples include depreciation of buildings and equipment, real estate taxes, insurance expenses, and salaries of top management and operating personnel. Even if operations are interrupted or cut back, committed fixed costs remain largely unchanged in the short term. During a recession, for example, a company won't usually eliminate key executive positions or sell off key facilities—the basic organizational structure and facilities ordinarily are kept intact. The costs of restoring them later are likely to be far greater than any short-run savings that might be realized.

Once a decision is made to acquire committed fixed resources, the company may be locked into that decision for many years to come. Consequently, such commitments should be made only after careful analysis of the available alternatives. Investment decisions involving committed fixed costs will be examined in a later chapter.

Discretionary Fixed Costs **Discretionary fixed costs** (often referred to as *managed fixed costs*) usually arise from *annual* decisions by management to spend on certain fixed cost items. Examples of discretionary fixed costs include advertising, research, public relations, management development programs, and internships for students.

Two key differences exist between discretionary fixed costs and committed fixed costs. First, the planning horizon for a discretionary fixed cost is short term—usually a single year. By contrast, committed fixed costs have a planning horizon that encompasses many years. Second, discretionary fixed costs can be cut for short periods of time with minimal damage to the long-run goals of the organization. For example, spending on management development programs can be reduced because of poor economic conditions. Although some unfavorable consequences may result from the cutback, it is doubtful that these consequences would be as great as those that would result if the company decided to economize by laying off key personnel.

Whether a particular cost is regarded as committed or discretionary may depend on management's strategy. For example, during recessions when the level of home building

is down, many construction companies lay off most of their workers and virtually disband operations. Other construction companies retain large numbers of employees on the payroll, even though the workers have little or no work to do. While these latter companies may be faced with short-term cash flow problems, it will be easier for them to respond quickly when economic conditions improve. And the higher morale and loyalty of their employees may give these companies a significant competitive advantage.

The most important characteristic of discretionary fixed costs is that management is not locked into its decisions regarding such costs. Discretionary costs can be adjusted from year to year or even perhaps during the course of a year if necessary.

IN BUSINESS

A Twist on Fixed and Variable Costs



Mission Controls designs and installs automation systems for food and beverage manufacturers. At most companies, when sales drop and cost cutting is necessary, top managers lay off workers. The founders of Mission Controls decided to do something different when sales drop—they slash their own salaries before they even consider letting any of their employees go. This makes their own salaries somewhat variable, while the wages and salaries of workers act more like fixed costs. The payoff is a loyal and committed workforce.

Source: Christopher Caggiano, “Employment, Guaranteed for Life,” *Inc.* magazine, October 15, 2002, p. 74.

The Trend toward Fixed Costs The trend in many industries is toward greater fixed costs relative to variable costs. Chores that used to be performed by hand have been taken over by machines. For example, grocery clerks at stores like **Safeway** and **Kroger** used to key in prices by hand on cash registers. Now stores are equipped with barcode readers that enter price and other product information automatically. In general, competition has created pressure to give customers more value for their money—a demand that often can only be satisfied by automating business processes. For example, an **H & R Block** employee used to fill out tax returns for customers by hand and the advice given to a customer largely depended on the knowledge of that particular employee. Now, sophisticated computer software based on the accumulated knowledge of many experts is used to complete tax returns, and the software provides tax planning and other advice tailored to the customer’s needs.

As automation intensifies, the demand for “knowledge” workers—those who work primarily with their minds rather than their muscles—has grown tremendously. Because

IN BUSINESS

A New Twist on Sending Jobs Offshore

SeaCode (www.sea-code.com) is a San Diego–based company that offers a new twist on the popular practice of outsourcing jobs from the United States to foreign countries with lower labor costs. The company houses 600 computer programmers from around the world on a cruise ship three miles off the coast of Los Angeles. This “floating tech factory” is subject to the labor laws of whatever flag the boat chooses to fly rather than to U.S. labor laws. SeaCode pays its “knowledge workers” \$1,500 to \$1,800 per month, which is below prevailing salaries on the U.S. mainland but exceeds the salaries in many countries. The company claims that it has been inundated with resumes of college graduates from across the globe.

SeaCode’s clients get access to highly skilled labor at a lower cost than would have to be paid for similar jobs housed on U.S. soil. In addition, rather than having to fly halfway around the world to places such as India or China to oversee projects, U.S. managers can fly to Los Angeles and in a brief time be three miles off the California coast checking on the status of “offshore” operations.

Source: Reed Tucker, “Will a Floating Tech Factory Fly?” *Fortune*, September 5, 2005, p. 28.

knowledge workers tend to be salaried, highly trained, and difficult to replace, the costs of compensating these workers are often relatively fixed and are committed rather than discretionary.

Is Labor a Variable or a Fixed Cost? As the preceding discussion suggests, wages and salaries may be fixed or variable. The behavior of wage and salary costs will differ from one country to another, depending on labor regulations, labor contracts, and custom. In some countries, such as France, Germany, and Japan, management has little flexibility in adjusting the labor force to changes in business activity. In countries such as the United States and the United Kingdom, management typically has much greater latitude. However, even in these less restrictive environments, managers may choose to treat employee compensation as a fixed cost for several reasons.

First, many managers are reluctant to decrease their workforce in response to short-term declines in sales. These managers realize that the success of their businesses hinges on retaining highly skilled and trained employees. If these valuable workers are laid off, it is unlikely that they would ever return or be easily replaced. Furthermore, laying off workers undermines the morale of those employees who remain.

Second, managers do not want to be caught with a bloated payroll in an economic downturn. Therefore, managers are reluctant to add employees in response to short-term increases in sales. Instead, more and more companies rely on temporary and part-time workers to take up the slack when their permanent, full-time employees are unable to handle all of the demand for their products and services. In such companies, labor costs are a complex mixture of fixed and variable costs.

Hedging Their Bets with Contingent Employees

IN BUSINESS

Companies in white-collar industries such as media, public relations, and technology frequently hire contingent employees from staffing agencies to reduce the risk of being saddled with a bloated payroll during a business downturn. Contingent employees earn an hourly wage from their staffing agency, but they do not receive any fringe benefits. Companies employing contingent workers like the flexibility of being able to lay off these people with one telephone call to the staffing agency. Brad Karsh, president of a Chicago employment-coaching service called **JobBound** recommends a similar lack of commitment to his clients who accept contingent employment positions. "It's exactly like dating," he says. "You don't want to be loyal if they're not going to be loyal to you."



Source: Daniel Nasaw, "Companies Are Hedging Their Bets by Hiring Contingent Employees," *The Wall Street Journal*, September 14, 2004, p. B10.

Many major companies have undergone waves of downsizing in recent years in which large numbers of employees—particularly managers—have lost their jobs. This downsizing may seem to suggest that even management salaries should be regarded as variable costs, but this would not be a valid conclusion. Downsizing has largely been the result of attempts to reengineer business processes and cut costs rather than a response to a decline in sales activity. This underscores an important, but subtle, point. Fixed costs can change—they just don't change in response to small changes in activity.

In sum, there is no clear-cut answer to the question "Is labor a variable or fixed cost?" It depends on how much flexibility management has to adjust the workforce and management's strategy. Nevertheless, unless otherwise stated, we will assume in this text that direct labor is a variable cost. This assumption is more likely to be valid for companies in the United States than in countries where employment laws permit much less flexibility.

Fixed Costs and the Relevant Range

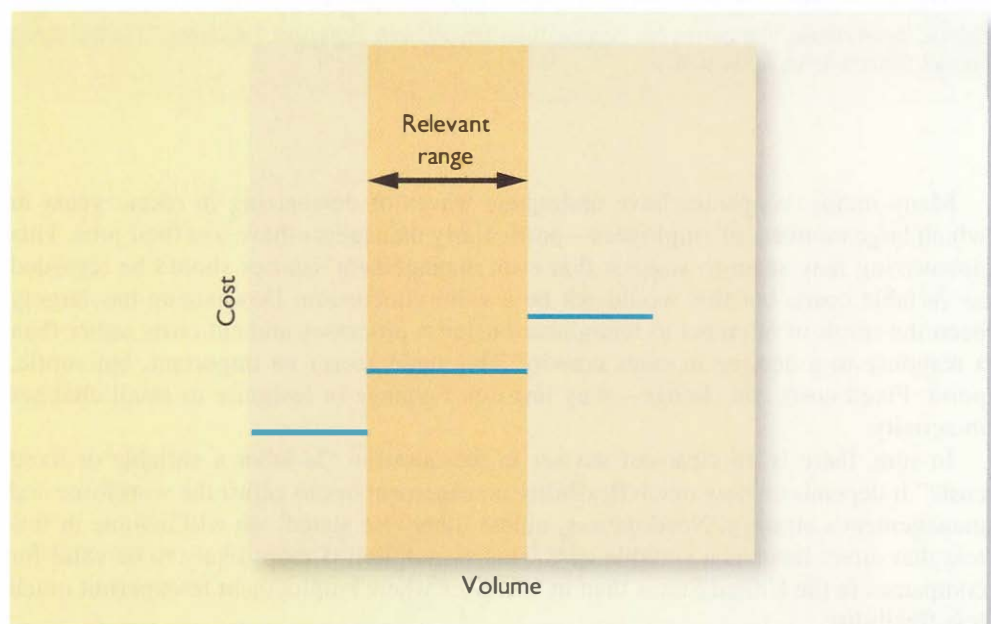
The concept of the relevant range, which was introduced in the discussion of variable costs, is also important in understanding fixed costs—particularly discretionary fixed costs—particularly discretionary fixed costs. The levels of discretionary fixed costs are typically decided at the beginning of the year and depend on the needs of planned programs such as advertising and training. The scope of these programs will depend, in turn, on the overall anticipated level of activity for the year. At very high levels of activity, programs are often broadened or expanded. For example, if the company hopes to increase sales by 25%, it would probably plan for much larger advertising costs than if no sales increase were planned. So the *planned* level of activity might affect total discretionary fixed costs. However, once the total discretionary fixed costs have been budgeted, they are unaffected by the *actual* level of activity. For example, once the advertising budget has been established and spent, it will not be affected by how many units are actually sold. Therefore, the cost is fixed with respect to the *actual* number of units sold.

Discretionary fixed costs are easier to adjust than committed fixed costs. They also tend to be less “lumpy.” Committed fixed costs consist of costs such as buildings, equipment, and the salaries of key personnel. It is difficult to buy half a piece of equipment or to hire a quarter of a product-line manager, so the step pattern depicted in Exhibit 5–6 is typical for such costs. The relevant range of activity for a fixed cost is the range of activity over which the graph of the cost is flat as in Exhibit 5–6. As a company expands its level of activity, it may outgrow its present facilities, or the key management team may need to be expanded. The result, of course, will be increased committed fixed costs as larger facilities are built and as new management positions are created.

One reaction to the step pattern depicted in Exhibit 5–6 is to conclude that discretionary and committed fixed costs are really just step-variable costs. To some extent this is true, because *almost* all costs can be adjusted in the long run. There are two major differences, however, between the step-variable costs depicted earlier in Exhibit 5–3 and the fixed costs depicted in Exhibit 5–6.

The first difference is that the step-variable costs can often be adjusted quickly as conditions change, whereas once fixed costs have been set, they usually can't be changed easily. A step-variable cost such as the wages of repair technicians, for example, can be adjusted upward or downward by hiring and laying off technicians. By contrast, once a company has signed a lease for a building, it is locked into that level of lease cost for the life of the contract.

EXHIBIT 5-6
Fixed Costs and the
Relevant Range



The second difference is that the *width of the steps* depicted for step-variable costs is much narrower than the width of the steps depicted for the fixed costs in Exhibit 5–6. The width of the steps relates to volume or level of activity. For step-variable costs, the width of a step might be 40 hours of activity per week in the case of repair technicians. For fixed costs, however, the width of a step might be *thousands* or even *tens of thousands* of hours of activity. In essence, the width of the steps for step-variable costs is generally so narrow that these costs can be treated essentially as variable costs for most purposes. The width of the steps for fixed costs, on the other hand, is so wide that these costs should be treated as entirely fixed within the relevant range.

Mixed Costs

A **mixed cost** contains both variable and fixed cost elements. Mixed costs are also known as semivariable costs. To continue the Nooksack Expeditions example, the company must pay a license fee of \$25,000 per year plus \$3 per rafting party to the state’s Department of Natural Resources. If the company runs 1,000 rafting parties this year, then the total fees paid to the state would be \$28,000, made up of \$25,000 in fixed cost plus \$3,000 in variable cost. Exhibit 5–7 depicts the behavior of this mixed cost.

Even if Nooksack fails to attract any customers, the company will still have to pay the license fee of \$25,000. This is why the cost line in Exhibit 5–7 intersects the vertical cost axis at the \$25,000 point. For each rafting party the company organizes, the total cost of the state fees will increase by \$3. Therefore, the total cost line slopes upward as the variable cost of \$3 per party is added to the fixed cost of \$25,000 per year.

Because the mixed cost in Exhibit 5–7 is represented by a straight line, the following equation for a straight line can be used to express the relationship between a mixed cost and the level of activity:

$$Y = a + bX$$

In this equation,

- Y = The total mixed cost
- a = The total fixed cost (the vertical intercept of the line)
- b = The variable cost per unit of activity (the slope of the line)
- X = The level of activity

Because the variable cost per unit equals the slope of the straight line, the steeper the slope, the higher the variable cost per unit.

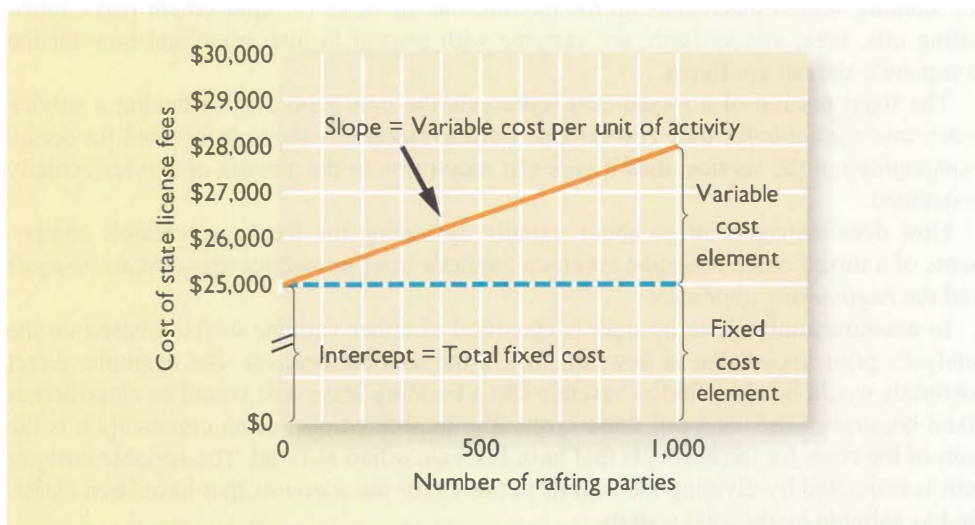


EXHIBIT 5–7
Mixed Cost Behavior

The **engineering approach** to cost analysis involves a detailed analysis of what cost behavior should be, based on an industrial engineer's evaluation of the production methods to be used, the materials specifications, labor requirements, equipment usage, production efficiency, power consumption, and so on. For example, **Pizza Hut** might use the engineering approach to estimate the cost of preparing and serving a particular take-out pizza. The cost of the pizza would be estimated by carefully costing the specific ingredients used to make the pizza, the power consumed to cook the pizza, and the cost of the container the pizza is delivered in. The engineering approach must be used in those situations where no past experience is available concerning activity and costs. In addition, it is sometimes used together with other methods to improve the accuracy of cost analysis.



Operations Drive Costs

White Grizzly Adventures is a snowcat skiing and snowboarding company in Meadow Creek, British Columbia, that is owned and operated by Brad and Carole Karafil. The company shuttles 12 guests to the top of the company's steep and tree-covered terrain in a modified snowcat. Guests stay as a group at the company's lodge for a fixed number of days and are provided healthy gourmet meals.

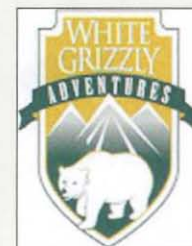
Brad and Carole must decide each year when snowcat operations will begin in December and when they will end in early spring, and how many nonoperating days to schedule between groups of guests for maintenance and rest. These decisions affect a variety of costs. Examples of costs that are fixed and variable with respect to the number of days of operation at White Grizzly include:

Cost	Cost Behavior—Fixed or Variable with Respect to Days of Operation
Property taxes	Fixed
Summer road maintenance and tree clearing	Fixed
Lodge depreciation	Fixed
Snowcat operator and guides	Variable
Cooks and lodge help	Variable
Snowcat depreciation	Variable
Snowcat fuel.....	Variable
Food*	Variable

*The costs of food served to guests theoretically depend on the number of guests in residence. However, the lodge is almost always filled to its capacity of 12 persons when the snowcat operation is running, so food costs can be considered to be driven by the days of operation.

Source: Brad & Carole Karafil, owners and operators of White Grizzly Adventures, www.whitegrizzly.com.

IN BUSINESS



Account analysis works best when analyzing costs at a fairly aggregated level, such as the cost of serving patients in the emergency room (ER) of **Cook County General Hospital**. The costs of drugs, supplies, forms, wages, equipment, and so on, can be roughly classified as variable or fixed and a mixed cost formula for the overall cost of the emergency room can be estimated fairly quickly. However, this method does not recognize that some of the accounts may have both fixed and variable cost elements. For example, the cost of electricity for the ER is a mixed cost. Most of the electricity is a fixed cost because it is used for heating and lighting. However, the consumption of electricity increases with

activity in the ER because diagnostic equipment, operating theater lights, defibrillators, and so on, all consume electricity. The most effective way to estimate the fixed and variable elements of such a mixed cost may be to analyze past records of cost and activity data. These records should reveal whether electrical costs vary significantly with the number of patients and if so, by how much. The remainder of this section explains how to conduct such an analysis of past cost and activity data.

CONCEPT CHECK



- Which of the following cost behavior assumptions is false? (You may select more than one answer.)
 - Variable cost per unit increases as the activity increases.
 - The average fixed cost per unit decreases as the activity increases.
 - Total variable costs decrease as the activity decreases.
 - Total fixed costs remain the same as the activity changes (within the relevant range).
- Which of the following statements is false? (You may select more than one answer.)
 - The planning horizon for discretionary fixed costs is longer than the planning horizon for committed fixed costs.
 - Discretionary fixed costs can be cut in the short term if necessary, while committed fixed costs cannot be cut for short periods of time.
 - As companies increasingly rely on knowledge workers, the labor cost associated with employing these workers is often committed fixed as opposed to discretionary.
 - A mixed cost contains both committed fixed and discretionary elements.

MANAGERIAL ACCOUNTING IN ACTION

The Issue



Dr. Derek Chalmers, the chief executive officer of Brentline Hospital, motioned Kinh Nguyen, the chief financial officer of the hospital, into his office.

Derek: I wanted to talk to you about our maintenance expenses. They seem to be bouncing around a lot. Over the last half year or so they have been as low as \$7,400 and as high as \$9,800 per month.

Kinh: That type of variation is normal for maintenance expenses.

Derek: But we budgeted a constant \$8,400 a month. Can't we do a better job of predicting what these costs are going to be? And how do we know when we've spent too much in a month? Shouldn't there be some explanation for these variations?

Kinh: Now that you mention it, we are in the process of tightening up our budgeting process. Our first step is to break all of our costs down into fixed and variable components.

Derek: How will that help?

Kinh: Well, it will permit us to predict what the level of costs will be. Some costs are fixed and shouldn't change much. Other costs go up and down as our activity goes up and down. The trick is to figure out what is driving the variable component of the costs.

Derek: What about the maintenance costs?

Kinh: My guess is that the variations in maintenance costs are being driven by our overall level of activity. When we treat more patients, our equipment is used more intensively, which leads to more maintenance expense.

Derek: How would you measure the level of overall activity? Would you use patient-days?

Kinh: I think so. Each day a patient is in the hospital counts as one patient-day. The greater the number of patient-days in a month, the busier we are. Besides, our budgeting is all based on projected patient-days.

Derek: Okay, so suppose you are able to break the maintenance costs down into fixed and variable components. What will that do for us?

Kinh: Basically, I will be able to predict what maintenance costs should be as a function of the number of patient-days.

Derek: I can see where that would be useful. We could use it to predict costs for budgeting purposes.

Kinh: We could also use it as a benchmark. Based on the actual number of patient-days for a period, I can predict what the maintenance costs should have been. We can compare this to the actual spending on maintenance.

Derek: Sounds good to me. Let me know when you get the results.

Diagnosing Cost Behavior with a Scattergraph Plot

Kinh Nguyen began his analysis of maintenance costs by collecting cost and activity data for a number of recent months. Those data are displayed below:

Month	Activity Level: Patient-Days	Maintenance Cost Incurred
January	5,600	\$7,900
February	7,100	\$8,500
March.....	5,000	\$7,400
April	6,500	\$8,200
May.....	7,300	\$9,100
June.....	8,000	\$9,800
July	6,200	\$7,800

LEARNING OBJECTIVE 2

Use a scattergraph plot to diagnose cost behavior.



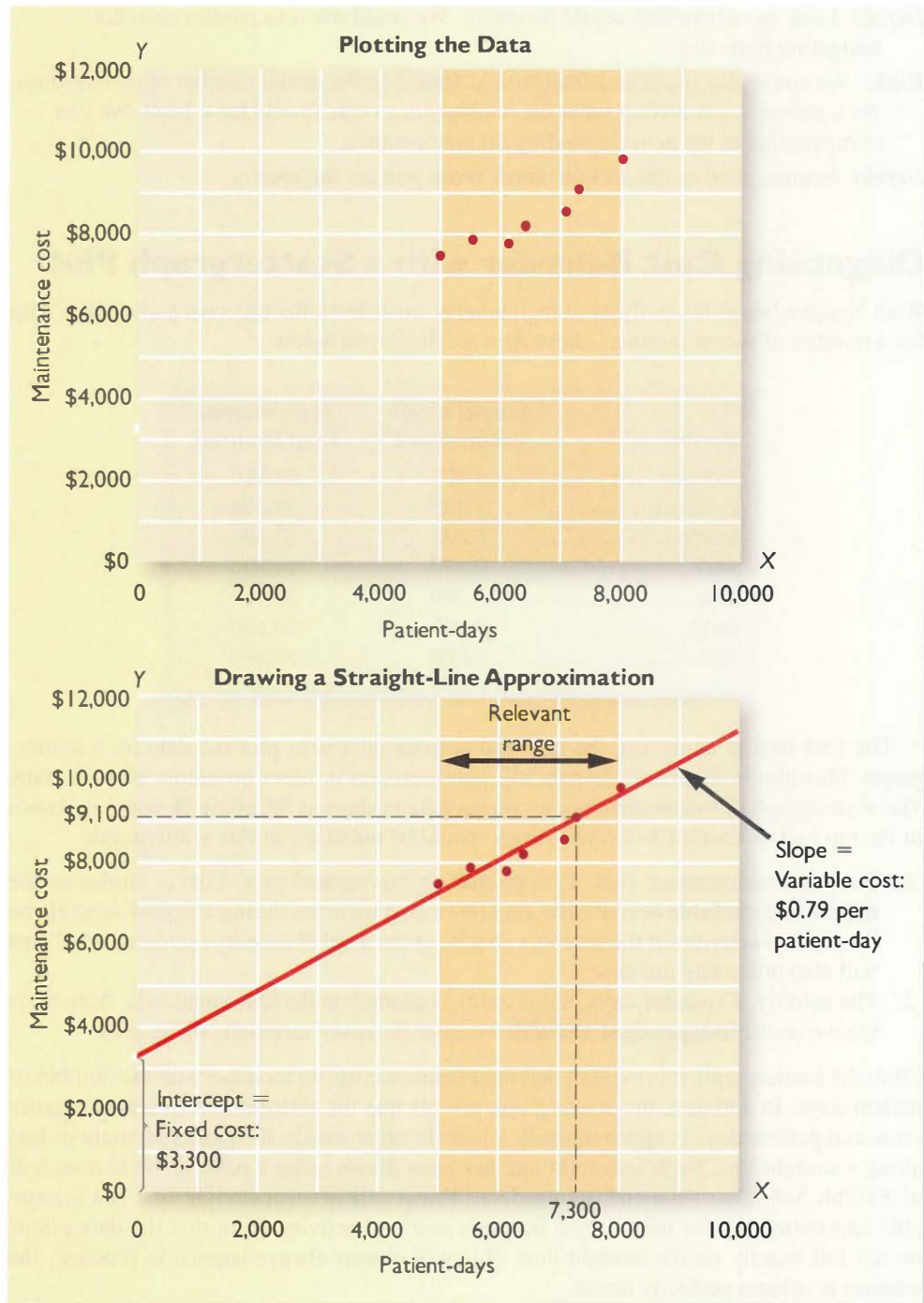
The first step in analyzing the cost and activity data is to plot the data on a scattergraph. This plot immediately reveals any nonlinearities or other problems with the data. The scattergraph of maintenance costs versus patient-days at Brentline Hospital is shown in the top half of Exhibit 5–8. Two things should be noted about this scattergraph:

1. The total maintenance cost, *Y*, is plotted on the vertical axis. Cost is known as the **dependent variable** because the amount of cost incurred during a period depends on the level of activity for the period. (That is, as the level of activity increases, total cost will also ordinarily increase.)
2. The activity, *X* (patient-days in this case), is plotted on the horizontal axis. Activity is known as the **independent variable** because it causes variations in the cost.

From the scattergraph, it is evident that maintenance costs do increase with the number of patient-days. In addition, the scattergraph reveals that the relation between maintenance costs and patient-days is approximately *linear*. In other words, the points lie more or less along a straight line. Such a straight line has been drawn using a ruler in the bottom half of Exhibit 5–8. Cost behavior is considered **linear** whenever a straight line is a reasonable approximation for the relation between cost and activity. Note that the data points do not fall exactly on the straight line. This will almost always happen in practice; the relation is seldom perfectly linear.

Note that the straight line in Exhibit 5–8 has been drawn through the point representing 7,300 patient-days and a total maintenance cost of \$9,100. Drawing the straight line through one of the data points helps make a quick-and-dirty estimate of variable and fixed costs. The vertical intercept where the straight line crosses the *Y* axis—in this case, about \$3,300—is the rough estimate of the fixed cost. The variable cost can be quickly estimated by subtracting the estimated fixed cost from the total cost at the point lying on the straight line.

Total maintenance cost for 7,300 patient-days (a point falling on the straight line)	\$9,100
Less estimated fixed cost (the vertical intercept)	3,300
Estimated total variable cost for 7,300 patient-days	<u>\$5,800</u>

EXHIBIT 5-8Scattergraph Method of
Cost Analysis

The average variable cost per unit at 7,300 patient-days is computed as follows:

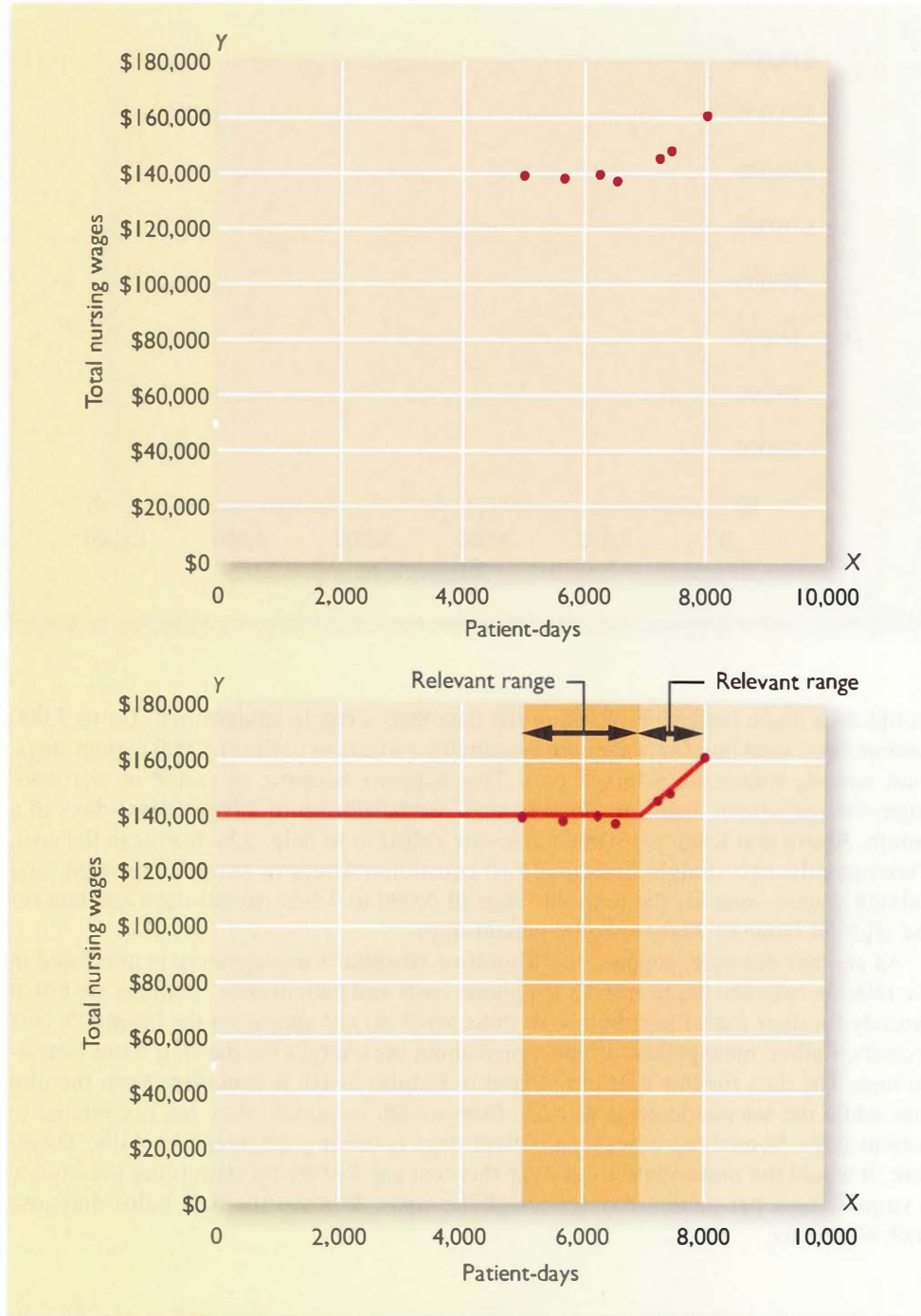
$$\begin{aligned}\text{Variable cost per unit} &= \$5,800 \div 7,300 \text{ patient-days} \\ &= \$0.79 \text{ per patient-day (rounded)}\end{aligned}$$

Combining the estimate of the fixed cost and the estimate of the variable cost per patient-day, we can express the relation between cost and activity as follows:

$$Y = \$3,300 + \$0.79X$$

where X is the number of patient-days.

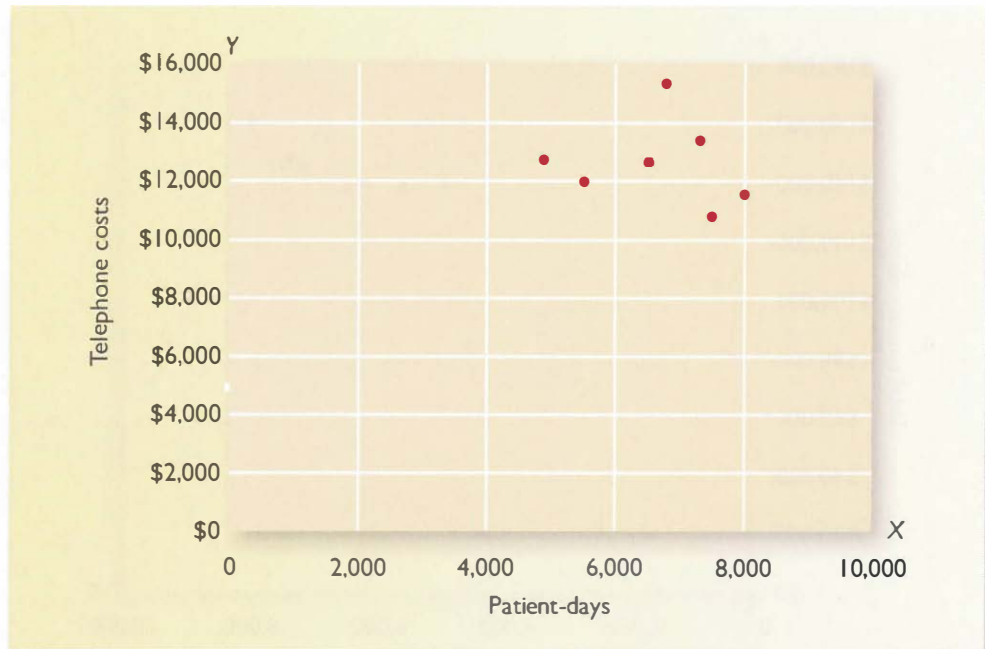
EXHIBIT 5-9
More than One Relevant Range



We hasten to add that this *is* a quick-and-dirty method of estimating the fixed and variable cost elements of a mixed cost; it is seldom used in practice when the financial implications of a decision based on the data are significant. However, setting aside the estimates of the fixed and variable cost elements, plotting the data on a scattergraph is an essential diagnostic step that is too often overlooked. Suppose, for example, we had been interested in the relation between total nursing wages and the number of patient-days at the hospital. The permanent, full-time nursing staff can handle up to 7,000 patient-days in a month. Beyond that level of activity, part-time nurses must be called in to help out. The cost and activity data for nurses are plotted on the scattergraph in Exhibit 5-9. Looking at that scattergraph, it is evident that two straight lines

EXHIBIT 5-10

A Diagnostic Scattergraph Plot



would do a much better job of fitting the data than a single straight line. Up to 7,000 patient-days, total nursing wages are essentially a fixed cost. Above 7,000 patient-days, total nursing wages are a mixed cost. This happens because, as stated on the prior page, the permanent, full-time nursing staff can handle up to 7,000 patient-days in a month. Above that level, part-time nurses are called in to help, which adds to the cost. Consequently, two straight lines (and two equations) would be used to represent total nursing wages—one for the relevant range of 5,000 to 7,000 patient-days and one for the relevant range of 7,000 to 8,000 patient-days.

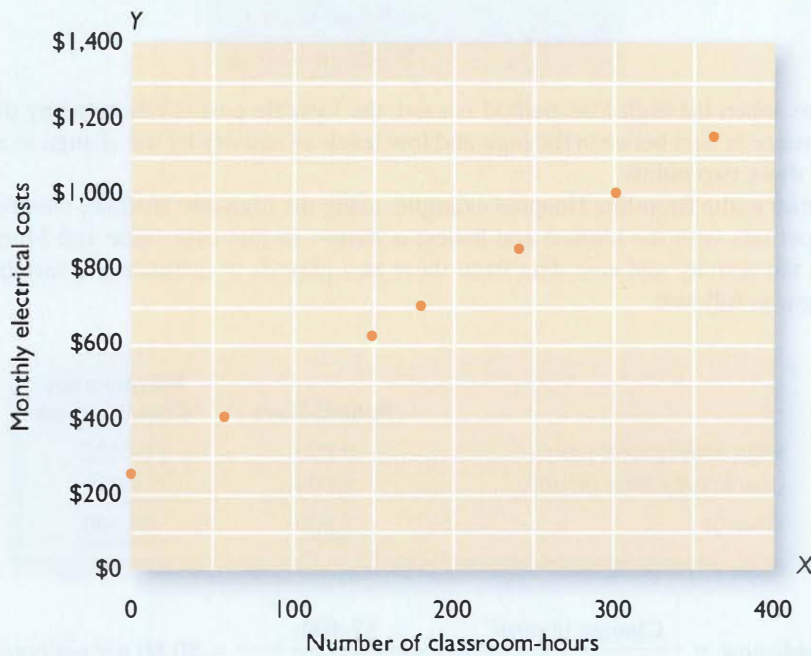
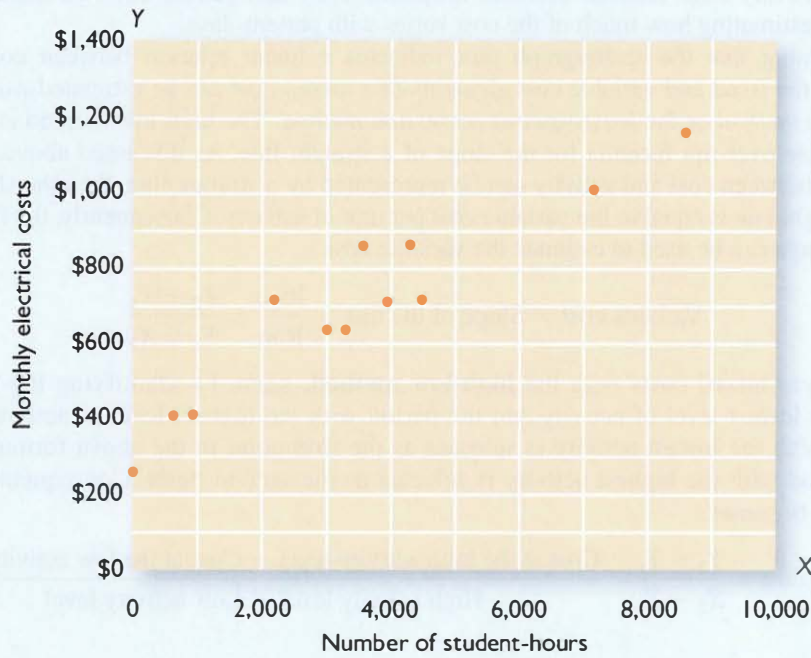
As another example, suppose that Brentline Hospital's management is interested in the relation between the hospital's telephone costs and patient-days. Patients are billed directly for their use of telephones, so those costs do not appear on the hospital's cost records. Rather, management is concerned about the charges for the staff's use of telephones. The data for this cost are plotted in Exhibit 5-10. It is evident from the plot that while the telephone costs do vary from month to month, they are not related to patient-days. Something other than patient-days is driving the telephone bills. Therefore, it would not make sense to analyze this cost any further by attempting to estimate a variable cost per patient-day for telephone costs. Plotting the data helps diagnose such situations.

YOU DECIDE**Choosing a Measure of Activity**

You are the manager of a for-profit company that helps students prepare for standardized exams such as the SAT. You have been trying to figure out what causes variations in your monthly electrical costs. Electricity is used primarily to run office equipment such as personal computers and to provide lighting for the business office and for classrooms. Below are scattergraphs that show monthly electrical costs plotted against two different possible measures of activity—student-hours and classroom-hours. A student who takes a course involving 10 hours of classroom time would be counted as 10 student-hours. Each hour a classroom is used is counted as one classroom-hour, regardless of the number of students in the classroom at the time.

YOU DECIDE

(continued)



Which measure of activity—student-hours or classroom-hours—best explains variations in monthly electrical costs and should therefore be used to estimate its variable cost component?

The High-Low Method

In addition to the quick-and-dirty method described in the preceding section, more precise methods are available for estimating fixed and variable costs. However, it must be emphasized that fixed and variable costs should be computed only if a scattergraph plot

LEARNING OBJECTIVE 3

Analyze a mixed cost using the high-low method.



confirms that the relation is approximately linear. In the case of maintenance costs at Brentline Hospital, the relation does appear to be linear. In the case of telephone costs, there isn't any clear relation between telephone costs and patient-days, so there is no point in estimating how much of the cost varies with patient-days.

Assuming that the scattergraph plot indicates a linear relation between cost and activity, the fixed and variable cost elements of a mixed cost can be estimated using the *high-low method* or the *least-squares regression method*. The high-low method is based on the rise-over-run formula for the slope of a straight line. As discussed above, if the relation between cost and activity can be represented by a straight line, then the slope of the straight line is equal to the variable cost per unit of activity. Consequently, the following formula can be used to estimate the variable cost.

$$\text{Variable cost} = \text{Slope of the line} = \frac{\text{Rise}}{\text{Run}} = \frac{Y_2 - Y_1}{X_2 - X_1}$$

To analyze mixed costs with the **high-low method**, begin by identifying the period with the lowest level of activity and the period with the highest level of activity. The period with the lowest activity is selected as the first point in the above formula and the period with the highest activity is selected as the second point. Consequently, the formula becomes:

$$\text{Variable cost} = \frac{Y_2 - Y_1}{X_2 - X_1} = \frac{\text{Cost at the high activity level} - \text{Cost at the low activity level}}{\text{High activity level} - \text{Low activity level}}$$

or

$$\text{Variable cost} = \frac{\text{Change in cost}}{\text{Change in activity}}$$

Therefore, when the high-low method is used, the variable cost is estimated by dividing the difference in cost between the high and low levels of activity by the change in activity between those two points.

To return to the Brentline Hospital example, using the high-low method, we first identify the periods with the highest and lowest *activity*—in this case, June and March. We then use the activity and cost data from these two periods to estimate the variable cost component as follows:

	Patient-Days	Maintenance Cost Incurred
High activity level (June)	8,000	\$9,800
Low activity level (March).....	5,000	7,400
Change	<u>3,000</u>	<u>\$2,400</u>

$$\text{Variable cost} = \frac{\text{Change in cost}}{\text{Change in activity}} = \frac{\$2,400}{3,000 \text{ patient-days}} = \$0.80 \text{ per patient-day}$$

Having determined that the variable maintenance cost is 80 cents per patient-day, we can now determine the amount of fixed cost. This is done by taking the total cost at *either* the high or the low activity level and deducting the variable cost element. In the computation below, total cost at the high activity level is used in computing the fixed cost element:

$$\begin{aligned} \text{Fixed cost element} &= \text{Total cost} - \text{Variable cost element} \\ &= \$9,800 - (\$0.80 \text{ per patient-day} \times 8,000 \text{ patient-days}) \\ &= \$3,400 \end{aligned}$$

Fortunately, computer software makes it very easy to use sophisticated statistical methods, such as *least-squares regression*, that use all of the data and that are capable of providing much more information than just the estimates of variable and fixed costs. The details of these statistical methods are beyond the scope of this text, but the basic approach is discussed below. Nevertheless, even if the least-squares regression approach is used, it is always a good idea to plot the data in a scattergraph. By simply looking at the scattergraph, you can quickly verify whether it makes sense to fit a straight line to the data using least-squares regression or some other method.

CONCEPT CHECK

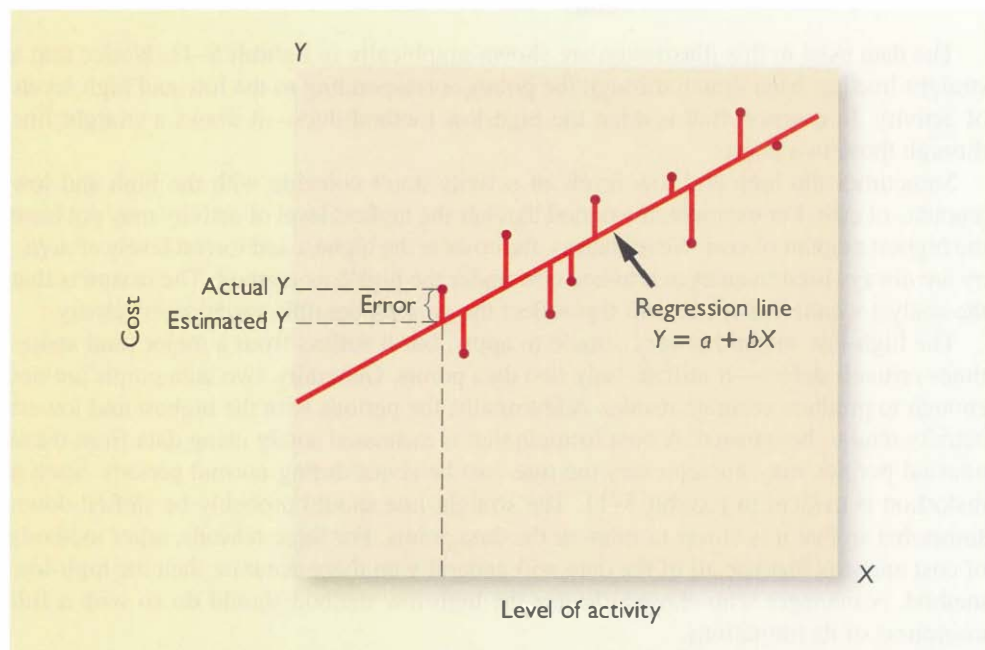
3. Assume a hotel rented 400, 480, and 420 rooms in the months of April, May, and June, respectively; and the total housekeeping costs for the three months in question were \$6,000, \$6,800, and \$6,200. With use of the high-low method, what is the amount of monthly fixed housekeeping costs?
- \$1,000
 - \$1,500
 - \$2,000
 - \$2,500

The Least-Squares Regression Method

The **least-squares regression method**, unlike the high-low method, uses all of the data to separate a mixed cost into its fixed and variable components. A *regression line* of the form $Y = a + bX$ is fitted to the data, where a represents the total fixed cost and b represents the variable cost per unit of activity. The basic idea underlying the least-squares regression method is illustrated in Exhibit 5-12 using hypothetical data points. Notice from the exhibit that the deviations from the plotted points to the regression line are measured vertically on the graph. These vertical deviations are called the regression errors. There is nothing mysterious about the least-squares regression method. It simply computes the regression line that minimizes the sum of these squared errors. The formulas that accomplish this are fairly complex and involve numerous calculations, but the principle is simple.

EXHIBIT 5-12

The Concept of Least-Squares Regression



Fortunately, computers are adept at carrying out the computations required by the least-squares regression formulas. The data—the observed values of X and Y —are entered into the computer, and software does the rest. In the case of the Brentline Hospital maintenance cost data, a statistical software package on a personal computer can calculate the following least-squares regression estimates of the total fixed cost (a) and the variable cost per unit of activity (b):

$$a = \$3,431$$

$$b = \$0.759$$

Therefore, using the least-squares regression method, the fixed element of the maintenance cost is \$3,431 per month and the variable portion is 75.9 cents per patient-day.

In terms of the linear equation $Y = a + bX$, the cost formula can be written as

$$Y = \$3,431 + \$0.759X$$

where activity (X) is expressed in patient-days.

In addition to estimates of the intercept (fixed cost) and slope (variable cost per unit), least-squares regression software ordinarily provides a number of other very useful statistics. One of these statistics is the R^2 , which is a measure of “goodness of fit.” The R^2 tells us the percentage of the variation in the dependent variable (cost) that is explained by variation in the independent variable (activity). The R^2 varies from 0% to 100%, and the higher the percentage, the better. In the case of the Brentline Hospital maintenance cost data, the R^2 is 0.90, which indicates that 90% of the variation in maintenance costs is explained by the variation in patient-days. This is reasonably high and is an indication of a good fit. On the other hand, a low R^2 would be an indication of a poor fit. You should always plot the data in a scattergraph, but it is particularly important to check the data visually when the R^2 is low. A quick look at the scattergraph can reveal that there is little relation between the cost and the activity or that the relation is something other than a simple straight line. In such cases, additional analysis would be required.

After completing the analysis of maintenance costs, Kinh Nguyen met with Dr. Derek Chalmers to discuss the results.

Kinh: We used least-squares regression analysis to estimate the fixed and variable components of maintenance costs. According to the results, the fixed cost per month is \$3,431 and the variable cost per patient-day is 75.9 cents.

Derek: Okay, so if we plan for 7,800 patient-days next month, what is your estimate of the maintenance costs?

Kinh: That will take just a few seconds to figure out. [Kinh wrote the following calculations on a pad of paper.]

Fixed costs	\$3,431
Variable costs:	
7,800 patient-days × \$0.759 per patient-day	5,920
Total expected maintenance costs	<u>\$9,351</u>

Derek: Nine thousand three hundred and fifty *one* dollars; isn't that a bit *too* precise?

Kinh: Sure. I don't really believe the maintenance costs will be exactly this figure. However, based on the information we have, this is the best estimate we can come up with.

Derek: This type of estimate will be a lot better than just guessing like we have done in the past. Thanks. I hope to see more of this kind of analysis.

MANAGERIAL ACCOUNTING IN ACTION
The Wrap-up



Multiple Regression Analysis

In the discussion thus far, we have assumed that a single factor such as patient-days drives the variable cost component of a mixed cost. This assumption is acceptable for many mixed costs, but in some situations the variable cost element may be driven by a number of factors. For example, shipping costs may depend on both the number of units shipped *and* the weight of the units. In a situation such as this, *multiple regression* is necessary. **Multiple regression** is an analytical method that is used when the dependent variable (i.e., cost) is caused by more than one factor. Although adding more factors, or variables, makes the computations more complex, the principles involved are the same as in the simple least-squares regressions discussed above.

THE CONTRIBUTION FORMAT INCOME STATEMENT

LEARNING OBJECTIVE 4

Prepare an income statement using the contribution format.



Separating costs into fixed and variable elements helps to predict costs and provide benchmarks. As we will see in later chapters, separating costs into fixed and variable elements is also often crucial in making decisions. This crucial distinction between fixed and variable costs is at the heart of the **contribution approach** to constructing income statements. The unique thing about the contribution approach is that it provides managers with an income statement that clearly distinguishes between fixed and variable costs and therefore facilitates planning, control, and decision making.

Why a New Income Statement Format?

An income statement prepared using the *traditional approach*, as illustrated in Chapter 1, is organized in a “functional” format—emphasizing the functions of production, administration, and sales. No attempt is made to distinguish between fixed and variable costs. Under the heading “Administrative expense,” for example, both variable and fixed costs are lumped together.

Although an income statement prepared in the functional format may be useful for external reporting purposes, it has serious limitations when used for internal purposes. Internally, managers need cost data organized in a format that will facilitate planning, control, and decision making. As we shall see in the chapters ahead, these tasks are much easier when costs are identified as fixed or variable. The contribution format income statement has been developed in response to these needs.

The Contribution Approach

Exhibit 5–13 uses a simple example to compare a contribution approach income statement to the traditional approach discussed in Chapter 1.

Notice that the contribution approach separates costs into fixed and variable categories, first deducting variable expenses from sales to obtain the *contribution margin*. The **contribution margin** is the amount remaining from sales revenues after variable expenses have been deducted. This amount *contributes* toward covering fixed expenses and then toward profits for the period.

The contribution format income statement is used as an internal planning and decision-making tool. Its emphasis on cost behavior facilitates cost-volume-profit analysis (such as we shall be doing in the next chapter), management performance appraisals, and budgeting. Moreover, the contribution approach helps managers organize data pertinent to numerous decisions such as product-line analysis, pricing, use of scarce resources, and make or buy analysis. All of these topics are covered in later chapters.

EXHIBIT 5-13 Comparison of the Contribution Income Statement with the Traditional Income Statement (the data are given)

Traditional Approach (costs organized by function)		Contribution Approach (costs organized by behavior)	
Sales.....	\$12,000	Sales	\$12,000
Cost of goods sold	<u>6,000*</u>	Variable expenses:	
Gross margin	6,000	Variable production	\$2,000
Selling and administrative expenses:		Variable selling	600
Selling.....	\$3,100*	Variable administrative	<u>400</u>
Administrative.....	<u>1,900*</u>	Contribution margin.....	<u>9,000</u>
Net operating income.....	<u>\$ 1,000</u>	Fixed expenses:	
		Fixed production.....	4,000
		Fixed selling	2,500
		Fixed administrative	<u>1,500</u>
		Net operating income.....	<u>\$ 1,000</u>

*Contains both variable and fixed expenses. This is the income statement for a manufacturing company; thus, when the income statement is placed in the contribution format, the "cost of goods sold" is divided between variable production costs and fixed production costs. If this were the income statement for a *merchandising* company (which simply purchases completed goods from a supplier), then the cost of goods sold would be *all* variable.

4. A company's contribution approach income statement showed net operating income of \$4,000, and fixed expenses of \$10,000. How much contribution margin did the company earn?
- \$29,000
 - \$15,000
 - \$19,000
 - \$14,000



SUMMARY

LO1 Understand how fixed and variable costs behave and how to use them to predict costs.

The total amount of a variable cost is proportional to the level of activity within the relevant range. The variable cost per unit of activity is constant as the level of activity changes.

The total amount of a fixed cost is constant as the level of activity changes within the relevant range. The fixed cost per unit of activity decreases as the level of activity increases because a constant amount is divided by a larger number.

To predict costs at a new level of activity, multiply the variable cost per unit by the new level of activity and then add to the result the total fixed cost.

LO2 Use a scattergraph plot to diagnose cost behavior.

A scattergraph plot helps provide insight into the behavior of a cost. In the scattergraph, activity is plotted on the horizontal, X, axis and total cost is plotted on the vertical, Y, axis. If the relation between cost and activity appears to be linear based on the scattergraph plot, then the variable and fixed components of a mixed cost can be estimated using the quick-and-dirty method, the high-low method, or the least-squares regression method.

LO3 Analyze a mixed cost using the high-low method.

To use the high-low method, first identify the periods with the highest and the lowest levels of activity. Second, estimate the variable cost element by dividing the change in total cost by the change in activity for these two periods. Third, estimate the fixed cost element by subtracting the total variable cost from the total cost at either the highest or the lowest level of activity.

The high-low method relies on only two, often unusual, data points rather than all of the available data and therefore may provide misleading estimates of variable and fixed costs.

LO4 Prepare an income statement using the contribution format.

Managers use costs organized by behavior in many decisions. To help managers make such decisions, the income statement can be prepared in a contribution format. The traditional income statement format emphasizes the purposes for which costs were incurred (i.e., to manufacture the product, to sell the product, or to administer the organization). In contrast, the contribution format income statement classifies costs by cost behavior (i.e., variable versus fixed).

GUIDANCE ANSWERS TO DECISION MAKER AND YOU DECIDE

Cost Analyst (p. 210)

Cost	Cost Behavior	Explanation
Administrative salaries	Fixed	Total administrative salaries would be unaffected by the number of guests.
Rental of the central kitchen	Fixed	The cost of renting the central kitchen would be unaffected by the number of guests.
Salary of the full-time chef	Fixed	The chef's salary would probably not be affected by the number of guests.
Wages of part-time cooks	Variable or step-variable	More cooks may be needed to prepare meals if the number of guests increases.
Groceries and kitchen supplies	Variable	These costs should be proportional to the number of guests.
Delivery vehicle depreciation and operating expenses	Fixed or mixed	The cost of operating the vehicle may be affected if more than one trip is necessary due to the number of guests.
Wages of part-time food servers	Variable or step-variable	More food servers may be needed if the number of guests increases.
Depreciation of silverware and dinnerware	Fixed or mixed	Wear and breakage should increase with the number of guests, but not depreciation due to obsolescence.
Cleaning of table linens	Variable or step-variable	More table linens may be needed if the number of guests increases.

Choosing a Measure of Activity (p. 216)

The relation between monthly electrical costs and classroom-hours seems more linear than the relation between monthly electrical costs and student-hours. A straight line drawn through the points on the second scattergraph relating monthly electrical costs to classroom-hours would explain virtually all of the variation in monthly electrical costs—the fit would be almost perfect. In contrast, a straight line drawn through the first scattergraph relating monthly electrical costs to student-hours would leave a lot of unexplained variation in costs—the fit would be far from perfect. On reflection, this makes sense. The cost of lighting a classroom for an hour is the same whether the classroom contains 1 or 20 students, so if the variations in monthly electrical costs are largely due to the costs of lighting classrooms, classroom-hours would be a better measure of activity than student-hours.

GUIDANCE ANSWERS TO CONCEPT CHECKS



1. **Choice a.** Variable cost per unit is constant.
2. **Choices a and d.** The planning horizon is shorter for discretionary fixed costs than for committed fixed costs. A mixed cost includes fixed and variable elements.
3. **Choice c.** The variable cost per room is $(\$6,800 - \$6,000) \div (480 - 400) = \10 . The fixed cost may be computed using the April data as follows: $\$6,000 - (400 \text{ rooms} \times \$10 \text{ variable cost per room}) = \$2,000$. A similar calculation can be completed for June.
4. **Choice d.** Net operating income = Contribution margin – Fixed expenses
 $\$4,000 = \text{Contribution margin} - \$10,000$
 Contribution margin = $\$4,000 + \$10,000 = \$14,000$

REVIEW PROBLEM I: COST BEHAVIOR

Neptune Rentals operates a boat rental service. Consider the following costs of the company over the relevant range of 5,000 to 8,000 hours of operating time for its boats:



	Hours of Operating Time			
	5,000	6,000	7,000	8,000
Total costs:				
Variable costs	\$ 20,000	\$?	\$?	\$?
Fixed costs	168,000	?	?	?
Total costs	\$188,000	\$?	\$?	\$?
Cost per hour:				
Variable cost	\$?	\$?	\$?	\$?
Fixed cost	?	?	?	?
Total cost per hour	\$?	\$?	\$?	\$?

Required:

Compute the missing amounts, assuming that cost behavior patterns remain unchanged within the relevant range of 5,000 to 8,000 hours.

Solution to Review Problem I

The variable cost per hour can be computed as follows:

$$\$20,000 \div 5,000 \text{ hours} = \$4 \text{ per hour}$$

Therefore, the missing amounts are as follows:

	Hours of Operating Time			
	5,000	6,000	7,000	8,000
Total costs:				
Variable costs				
(@ \$4 per hour)	\$ 20,000	\$ 24,000	\$ 28,000	\$ 32,000
Fixed costs	168,000	168,000	168,000	168,000
Total costs	\$188,000	\$192,000	\$196,000	\$200,000
Cost per hour:				
Variable cost	\$ 4.00	\$ 4.00	\$ 4.00	\$ 4.00
Fixed cost	33.60	28.00	24.00	21.00
Total cost per hour	\$ 37.60	\$ 32.00	\$ 28.00	\$ 25.00

Observe that the total variable costs increase in proportion to the number of hours of operating time, but that these costs remain constant at \$4 if expressed on a per hour basis.

In contrast, the total fixed costs do not change with changes in the level of activity. They remain constant at \$168,000 within the relevant range. With increases in activity, however, the fixed cost per hour decreases, dropping from \$33.60 per hour when the boats are operated 5,000 hours a period to only \$21.00 per hour when the boats are operated 8,000 hours a period. *Because of this troublesome aspect of fixed costs, they are most easily (and most safely) dealt with on a total basis, rather than on a unit basis, in cost analysis work.*

REVIEW PROBLEM 2: HIGH-LOW METHOD



The administrator of Azalea Hills Hospital would like a cost formula linking the administrative costs involved in admitting patients to the number of patients admitted during a month. The Admitting Department's costs and the number of patients admitted during the immediately preceding eight months are given in the following table:

Month	Number of Patients Admitted	Admitting Department Costs
May	1,800	\$14,700
June	1,900	\$15,200
July	1,700	\$13,700
August.....	1,600	\$14,000
September	1,500	\$14,300
October	1,300	\$13,100
November	1,100	\$12,800
December	1,500	\$14,600

Required:

- Use the high-low method to estimate the fixed and variable components of admitting costs.
- Express the fixed and variable components of admitting costs as a cost formula in the form $Y = a + bX$.

Solution to Review Problem 2

- The first step in the high-low method is to identify the periods of the lowest and highest activity. Those periods are November (1,100 patients admitted) and June (1,900 patients admitted). The second step is to compute the variable cost per unit using those two data points:

Month	Number of Patients Admitted	Admitting Department Costs
High activity level (June)	1,900	\$15,200
Low activity level (November)	<u>1,100</u>	<u>12,800</u>
Change	<u>800</u>	<u>\$ 2,400</u>

$$\text{Variable cost} = \frac{\text{Change in cost}}{\text{Change in activity}} = \frac{\$2,400}{800 \text{ patients admitted}} = \$3 \text{ per patient admitted}$$

The third step is to compute the fixed cost element by deducting the variable cost element from the total cost at either the high or low activity. In the computation below, the high point of activity is used:

$$\begin{aligned} \text{Fixed cost element} &= \text{Total cost} - \text{Variable cost element} \\ &= \$15,200 - (\$3 \text{ per patient admitted} \times 1,900 \text{ patients admitted}) \\ &= \$9,500 \end{aligned}$$

- The cost formula is $Y = \$9,500 + \$3X$.

GLOSSARY

- Account analysis** A method for analyzing cost behavior in which an account is classified as either variable or fixed based on the analyst's prior knowledge of how the cost in the account behaves. (p. 210)
- Activity base** A measure of whatever causes the incurrence of a variable cost. For example, the total cost of X-ray film in a hospital will increase as the number of X-rays taken increases. Therefore, the number of X-rays is the activity base that explains the total cost of X-ray film. (p. 199)
- Committed fixed costs** Investments in facilities, equipment, and basic organizational structure that can't be significantly reduced even for short periods of time without making fundamental changes. (p. 205)
- Contribution approach** An income statement format that organizes costs by their behavior. Costs are separated into variable and fixed categories rather than being separated according to organizational functions. (p. 222)
- Contribution margin** The amount remaining from sales revenues after all variable expenses have been deducted. (p. 222)
- Cost structure** The relative proportion of fixed, variable, and mixed costs in an organization. (p. 198)
- Dependent variable** A variable that responds to some causal factor; total cost is the dependent variable, as represented by the letter Y , in the equation $Y = a + bX$. (p. 213)
- Discretionary fixed costs** Those fixed costs that arise from annual decisions by management to spend on certain fixed cost items, such as advertising and research. (p. 205)
- Engineering approach** A detailed analysis of cost behavior based on an industrial engineer's evaluation of the inputs that are required to carry out a particular activity and of the prices of those inputs. (p. 211)
- High-low method** A method of separating a mixed cost into its fixed and variable elements by analyzing the change in cost between the high and low activity levels. (p. 218)
- Independent variable** A variable that acts as a causal factor; activity is the independent variable, as represented by the letter X , in the equation $Y = a + bX$. (p. 213)
- Least-squares regression method** A method of separating a mixed cost into its fixed and variable elements by fitting a regression line that minimizes the sum of the squared errors. (p. 220)
- Linear cost behavior** Cost behavior is said to be linear whenever a straight line is a reasonable approximation for the relation between cost and activity. (p. 213)
- Mixed cost** A cost that contains both variable and fixed cost elements. (p. 209)
- Multiple regression** An analytical method required when variations in a dependent variable are caused by more than one factor. (p. 222)
- R^2** A measure of goodness of fit in least-squares regression analysis. It is the percentage of the variation in the dependent variable that is explained by variation in the independent variable. (p. 221)
- Relevant range** The range of activity within which assumptions about variable and fixed cost behavior are reasonably valid. (p. 203)
- Step-variable cost** The cost of a resource that is obtained in large chunks and that increases and decreases only in response to fairly wide changes in activity. (p. 201)

QUESTIONS

- 5-1 Distinguish between (a) a variable cost, (b) a fixed cost, and (c) a mixed cost.
- 5-2 What effect does an increase in volume have on—
 a. Unit fixed costs?
 b. Unit variable costs?
 c. Total fixed costs?
 d. Total variable costs?
- 5-3 Define the following terms: (a) cost behavior and (b) relevant range.
- 5-4 What is meant by an *activity base* when dealing with variable costs? Give several examples of activity bases.
- 5-5 Distinguish between (a) a variable cost, (b) a mixed cost, and (c) a step-variable cost. Plot the three costs on a graph, with activity plotted horizontally and cost plotted vertically.
- 5-6 Managers often assume a strictly linear relationship between cost and volume. How can this practice be defended in light of the fact that many costs are curvilinear?
- 5-7 Distinguish between discretionary fixed costs and committed fixed costs.
- 5-8 Classify the following fixed costs as normally being either committed or discretionary:
 a. Depreciation on buildings.
 b. Advertising.
 c. Research.
 d. Long-term equipment leases.
 e. Pension payments to the company's retirees.
 f. Management development and training.

- 5-9 Does the concept of the relevant range apply to fixed costs? Explain.
- 5-10 What is the major disadvantage of the high-low method?
- 5-11 Give the general formula for a mixed cost. Which term represents the variable cost? The fixed cost?
- 5-12 What is meant by the term *least-squares regression*?
- 5-13 What is the difference between ordinary least-squares regression analysis and multiple regression analysis?
- 5-14 What is the difference between a contribution approach income statement and a traditional approach income statement?
- 5-15 What is the contribution margin?



Multiple-choice questions are provided on the text website at www.mhhe.com/brewer5e.

BRIEF EXERCISES connect



BRIEF EXERCISE 5-1 Fixed and Variable Cost Behavior [LO1]

Espresso Express operates a number of espresso coffee stands in busy suburban malls. The fixed weekly expense of a coffee stand is \$1,200 and the variable cost per cup of coffee served is \$0.22.

Required:

- Fill in the following table with your estimates of total costs and cost per cup of coffee at the indicated levels of activity for a coffee stand. Round off the cost of a cup of coffee to the nearest tenth of a cent.

	Cups of Coffee Served in a Week		
	2,000	2,100	2,200
Fixed cost.....	?	?	?
Variable cost.....	?	?	?
Total costs.....	?	?	?
Average cost per cup of coffee served.....	?	?	?

- Does the average cost per cup of coffee served increase, decrease, or remain the same as the number of cups of coffee served in a week increases? Explain.

BRIEF EXERCISE 5-2 Scattergraph Analysis [LO2]

Oki Products, Ltd., has observed the following processing costs at various levels of activity over the last 15 months:

Month	Units Produced	Processing Cost
1.....	4,500	\$38,000
2.....	11,000	\$52,000
3.....	12,000	\$56,000
4.....	5,500	\$40,000
5.....	9,000	\$47,000
6.....	10,500	\$52,000
7.....	7,500	\$44,000
8.....	5,000	\$41,000
9.....	11,500	\$52,000
10.....	6,000	\$43,000
11.....	8,500	\$48,000
12.....	10,000	\$50,000
13.....	6,500	\$44,000
14.....	9,500	\$48,000
15.....	8,000	\$46,000

Required:

1. Prepare a scattergraph using the above data. Plot cost on the vertical axis and activity on the horizontal axis. Fit a line to your plotted points using a ruler.
2. Using the quick-and-dirty method, what is the approximate monthly fixed cost? The approximate variable cost per unit processed? Show your computations.

BRIEF EXERCISE 5-3 High-Low Method [LO3]

The Cheyenne Hotel in Big Sky, Montana, has accumulated records of the total electrical costs of the hotel and the number of occupancy-days over the last year. An occupancy-day represents a room rented out for one day. The hotel's business is highly seasonal, with peaks occurring during the ski season and in the summer.



Month	Occupancy-Days	Electrical Costs
January	1,736	\$4,127
February.....	1,904	\$4,207
March.....	2,356	\$5,083
April.....	960	\$2,857
May.....	360	\$1,871
June.....	744	\$2,696
July.....	2,108	\$4,670
August.....	2,406	\$5,148
September	840	\$2,691
October.....	124	\$1,588
November.....	720	\$2,454
December.....	1,364	\$3,529

Required:

1. Using the high-low method, estimate the fixed cost of electricity per month and the variable cost of electricity per occupancy-day. Round off the fixed cost to the nearest whole dollar and the variable cost to the nearest whole cent.
2. What other factors other than occupancy-days are likely to affect the variation in electrical costs from month to month?

BRIEF EXERCISE 5-4 Contribution Format Income Statement [LO4]

The Alpine House, Inc., is a large retailer of winter sports equipment. An income statement for the company's Ski Department for a recent quarter is presented below:



The Alpine House, Inc.		
Income Statement—Ski Department		
For the Quarter Ended March 31		
Sales.....		\$150,000
Cost of goods sold.....		<u>90,000</u>
Gross margin		60,000
Selling and administrative expenses:		
Selling expenses.....	\$30,000	
Administrative expenses.....	<u>10,000</u>	<u>40,000</u>
Net operating income.....		<u>\$ 20,000</u>

Skis sell, on the average, for \$750 per pair. Variable selling expenses are \$50 per pair of skis sold. The remaining selling expenses are fixed. The administrative expenses are 20% variable and 80% fixed. The company does not manufacture its own skis; it purchases them from a supplier for \$450 per pair.

Required:

1. Prepare a contribution format income statement for the quarter.
2. For every pair of skis sold during the quarter, what was the contribution toward covering fixed expenses and toward earning profits?

EXERCISES

**EXERCISE 5-5 Cost Behavior; Contribution Format Income Statement [LO1, LO4]**

Harris Company manufactures and sells a single product. A partially completed schedule of the company's total and per unit costs over the relevant range of 30,000 to 50,000 units produced and sold annually is given below:

	Units Produced and Sold		
	30,000	40,000	50,000
Total costs:			
Variable costs.....	\$180,000	?	?
Fixed costs.....	300,000	?	?
Total costs.....	<u>\$480,000</u>	<u>?</u>	<u>?</u>
Cost per unit:			
Variable cost.....	?	?	?
Fixed cost.....	?	?	?
Total cost per unit.....	<u>?</u>	<u>?</u>	<u>?</u>

Required:

- Complete the schedule of the company's total and unit costs above.
- Assume that the company produces and sells 45,000 units during the year at a selling price of \$16 per unit. Prepare a contribution format income statement for the year.

**EXERCISE 5-6 High-Low Method; Scattergraph Analysis [LO2, LO3]**

The following data relating to units shipped and total shipping expense have been assembled by Archer Company, a wholesaler of large, custom-built air-conditioning units for commercial buildings:

Month	Units Produced	Total Shipping Expense
January.....	3	\$1,800
February.....	6	\$2,300
March.....	4	\$1,700
April.....	5	\$2,000
May.....	7	\$2,300
June.....	8	\$2,700
July.....	2	\$1,200

Required:

- Using the high-low method, estimate a cost formula for shipping expense.
- The president of the company has no confidence in the high-low method and would like you to check your results using a scattergraph.
 - Prepare a scattergraph, using the data given above. Plot cost on the vertical axis and activity on the horizontal axis. Use a ruler to fit a straight line to your plotted points.
 - Using your scattergraph, estimate the approximate variable cost per unit shipped and the approximate fixed cost per month with the quick-and-dirty method.
- What factors, other than the number of units shipped, are likely to affect the company's total shipping expense? Explain.

**EXERCISE 5-7 Cost Behavior; High-Low Method [LO1, LO3]**

Hoi Chong Transport, Ltd., operates a fleet of delivery trucks in Singapore. The company has determined that if a truck is driven 105,000 kilometers during a year, the average operating cost is 11.4 cents per

kilometer. If a truck is driven only 70,000 kilometers during a year, the average operating cost increases to 13.4 cents per kilometer. (The Singapore dollar is the currency used in Singapore.)

Required:

- Using the high-low method, estimate the variable and fixed cost elements of the annual cost of the truck operation.
- Express the variable and fixed costs in the form $Y = a + bX$.
- If a truck were driven 80,000 kilometers during a year, what total cost would you expect to be incurred?

EXERCISE 5-8 High-Low Method; Predicting Cost [LO1, LO3]

The Lakeshore Hotel's guest-days of occupancy and custodial supplies expense over the last seven months were:



Month	Guest-Days of Occupancy	Custodial Supplies Expense
March.....	4,000	\$7,500
April.....	6,500	\$8,250
May.....	8,000	\$10,500
June.....	10,500	\$12,000
July.....	12,000	\$13,500
August.....	9,000	\$10,750
September.....	7,500	\$9,750

Guest-days is a measure of the overall activity at the hotel. For example, a guest who stays at the hotel for three days is counted as three guest-days.

Required:

- Using the high-low method, estimate a cost formula for custodial supplies expense.
- Using the cost formula you derived above, what amount of custodial supplies expense would you expect to be incurred at an occupancy level of 11,000 guest-days?

EXERCISE 5-9 Scattergraph Analysis; High-Low Method [LO2, LO3]

Refer to the data for Lakeshore Hotel in Exercise 5-8.



Required:

- Prepare a scattergraph using the data from Exercise 5-8. Plot cost on the vertical axis and activity on the horizontal axis. Using a ruler, fit a straight line to your plotted points.
- Using the quick-and-dirty method, what is the approximate monthly fixed cost? The approximate variable cost per guest-day?
- Scrutinize the points on your graph and explain why the high-low method would or would not yield an accurate cost formula in this situation.

EXERCISE 5-10 High-Low Method; Predicting Cost [LO1, LO3]

St. Mark's Hospital contains 450 beds. The average occupancy rate is 80% per month. In other words, on average, 80% of the hospital's beds are occupied by patients. At this level of occupancy, the hospital's operating costs are \$32 per occupied bed per day, assuming a 30-day month. This \$32 figure contains both variable and fixed cost elements.



During June, the hospital's occupancy rate was only 60%. A total of \$326,700 in operating cost was incurred during the month.

Required:

- Using the high-low method, estimate:
 - The variable cost per occupied bed on a daily basis.
 - The total fixed operating costs per month.
- Assume an occupancy rate of 70% per month. What amount of total operating cost would you expect the hospital to incur?

PROBLEMS



Alternate problem set is available on the text website.

CHECK FIGURE

- (1) Net operating income: \$8,000



PROBLEM 5-11A Contribution Format versus Traditional Income Statement [LO4]

Marwick’s Pianos, Inc., purchases pianos from a large manufacturer and sells them at the retail level. The pianos cost, on the average, \$2,450 each from the manufacturer. Marwick’s Pianos, Inc., sells the pianos to its customers at an average price of \$3,125 each. The selling and administrative costs that the company incurs in a typical month are presented below:

Costs	Cost Formula
Selling:	
Advertising.....	\$700 per month
Sales salaries and commissions	\$950 per month, plus 8% of sales
Delivery of pianos to customers	\$30 per piano sold
Utilities.....	\$350 per month
Depreciation of sales facilities	\$800 per month
Administrative:	
Executive salaries	\$2,500 per month
Insurance.....	\$400 per month
Clerical	\$1,000 per month, plus \$20 per piano sold
Depreciation of office equipment.....	\$300 per month

During August, Marwick’s Pianos, Inc., sold and delivered 40 pianos.

Required:

1. Prepare an income statement for Marwick’s Pianos, Inc., for August. Use the traditional format, with costs organized by function.
2. Redo (1) above, this time using the contribution format, with costs organized by behavior. Show costs and revenues on both a total and a per unit basis down through contribution margin.
3. Refer to the income statement you prepared in (2) above. Why might it be misleading to show the fixed costs on a per unit basis?

CHECK FIGURE

- (2) Shipping: A\$18,000 per month plus A\$4 per unit



PROBLEM 5-12A Cost Behavior; High-Low Method; Contribution Format Income Statement [LO1, LO3, LO4]

Morrisey & Brown, Ltd., of Sydney is a merchandising company that is the sole distributor of a product that is increasing in popularity among Australian consumers. The company’s income statements for the three most recent months follow:

Morrisey & Brown, Ltd.			
Income Statements			
For the Three Months Ended September 30			
	July	August	September
Sales in units.....	4,000	4,500	5,000
Sales revenue.....	A\$400,000	A\$450,000	A\$500,000
Cost of goods sold	240,000	270,000	300,000
Gross margin	160,000	180,000	200,000
Selling and administrative expenses:			
Advertising expense	21,000	21,000	21,000
Shipping expense.....	34,000	36,000	38,000
Salaries and commissions.....	78,000	84,000	90,000
Insurance expense	6,000	6,000	6,000
Depreciation expense.....	15,000	15,000	15,000
Total selling and administrative expenses	154,000	162,000	170,000
Net operating income	A\$ 6,000	A\$ 18,000	A\$ 30,000

(Note: Morrisey & Brown, Ltd.'s Australian-formatted income statement has been recast in the format common in the United States. The Australian dollar is denoted here by A\$.)

Required:

1. Identify each of the company's expenses (including cost of goods sold) as either variable, fixed, or mixed.
2. Using the high-low method, separate each mixed expense into variable and fixed elements. State the cost formula for each mixed expense.
3. Redo the company's income statement at the 5,000-unit level of activity using the contribution format.

PROBLEM 5-13A Identifying Cost Behavior Patterns [LO1]

A number of graphs displaying cost behavior patterns are shown below. The vertical axis on each graph represents total cost, and the horizontal axis represents level of activity (volume).

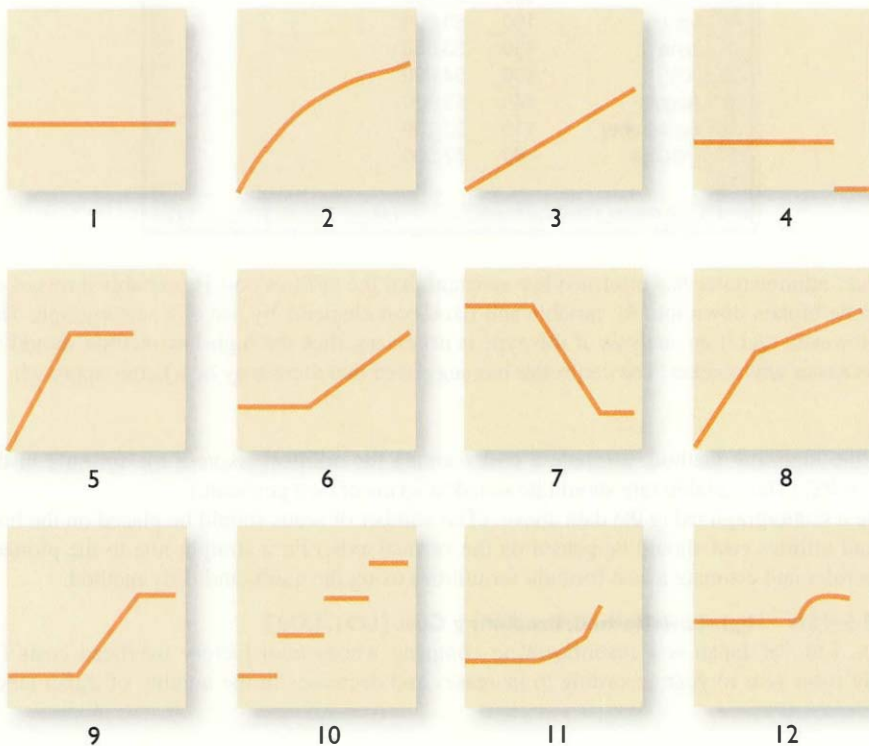


Required:

1. For each of the following situations, identify the graph below that illustrates the cost behavior pattern involved. Any graph may be used more than once.
 - a. Cost of raw materials used.
 - b. Electricity bill—a flat fixed charge, plus a variable cost after a certain number of kilowatt-hours are used.
 - c. City water bill, which is computed as follows:

First 1,000,000 gallons or less	\$1,000 flat fee
Next 10,000 gallons	\$0.003 per gallon used
Next 10,000 gallons	\$0.006 per gallon used
Next 10,000 gallons	\$0.009 per gallon used
Etc.....	Etc.

- d. Depreciation of equipment, where the amount is computed by the straight-line method. When the depreciation rate was established, it was anticipated that the obsolescence factor would be greater than the wear and tear factor.
- e. Rent on a factory building donated by the city, where the agreement calls for a fixed fee payment unless 200,000 labor-hours or more are worked, in which case no rent need be paid.



- f. Salaries of maintenance workers, where one maintenance worker is needed for every 1,000 hours of machine-hours or less (that is, 0 to 1,000 hours requires one maintenance worker, 1,001 to 2,000 hours requires two maintenance workers, etc.).
 - g. Cost of raw materials, where the cost starts at \$7.50 per unit and then decreases by 5 cents per unit for each of the first 100 units purchased, after which it remains constant at \$2.50 per unit.
 - h. Rent on a factory building donated by the county, where the agreement calls for rent of \$100,000 less \$1 for each direct labor-hour worked in excess of 200,000 hours, but a minimum rental payment of \$20,000 must be paid.
 - i. Use of a machine under a lease, where a minimum charge of \$1,000 is paid for up to 400 hours of machine time. After 400 hours of machine time, an additional charge of \$2 per hour is paid up to a maximum charge of \$2,000 per period.
2. How would a knowledge of cost behavior patterns such as those above be of help to a manager in analyzing the cost structure of his or her company?

(CPA, adapted)

CHECK FIGURE

- (1) \$1,000 per month plus
\$20 per scan

**PROBLEM 5-14A High-Low and Scattergraph Analysis [LO2, LO3]**

Pleasant View Hospital of British Columbia has just hired a new chief administrator who is anxious to employ sound management and planning techniques in the business affairs of the hospital. Accordingly, she has directed her assistant to summarize the cost structure of the various departments so that data will be available for planning purposes.

The assistant is unsure how to classify the utilities costs in the Radiology Department because these costs do not exhibit either strictly variable or fixed cost behavior. Utilities costs are very high in the department due to a CAT scanner that draws a large amount of power and is kept running at all times. The scanner can't be turned off due to the long warm-up period required for its use. When the scanner is used to scan a patient, it consumes an additional burst of power. The assistant has accumulated the following data on utilities costs and use of the scanner since the first of the year.

	A	B	C	D	E
1	Mon h	Number of Scans	Utilities Cost		
2	January	60	\$2,200		
3	February	70	\$2,600		
4	March	90	\$2,900		
5	April	120	\$3,300		
6	May	100	\$3,000		
7	June	130	\$3,600		
8	July	150	\$4,000		
9	August	140	\$3,600		
10	September	110	\$3,100		
11	October	80	\$2,500		
12					

The chief administrator has informed her assistant that the utilities cost is probably a mixed cost that will have to be broken down into its variable and fixed cost elements by use of a scattergraph. The assistant feels, however, that if an analysis of this type is necessary, then the high-low method should be used, because it is easier and quicker. The controller has suggested that there may be a better approach.

Required:

1. Using the high-low method, estimate a cost formula for utilities. Express the formula in the form $Y = a + bX$. (The variable rate should be stated in terms of cost per scan.)
2. Prepare a scattergraph using the data above. (The number of scans should be placed on the horizontal axis, and utilities cost should be placed on the vertical axis.) Fit a straight line to the plotted points using a ruler and estimate a cost formula for utilities using the quick-and-dirty method.

CHECK FIGURE

- (2) ¥1,500,000 per year plus
¥35 per DLH

PROBLEM 5-15A High-Low Method; Predicting Cost [LO1, LO3]

Sawaya Co., Ltd., of Japan is a manufacturing company whose total factory overhead costs fluctuate considerably from year to year according to increases and decreases in the number of direct labor-hours

worked in the factory. Total factory overhead costs (in Japanese yen, denoted ¥) at high and low levels of activity for recent years are given below:

	Level of Activity	
	Low	High
Direct labor-hours	50,000	75,000
Total factory overhead costs.....	¥14,250,000	¥17,625,000

The factory overhead costs above consist of indirect materials, rent, and maintenance. The company has analyzed these costs at the 50,000-hour level of activity as follows:

Indirect materials (variable)	¥ 5,000,000
Rent (fixed)	6,000,000
Maintenance (mixed)	3,250,000
Total factory overhead costs	<u>¥14,250,000</u>

To have data available for planning, the company wants to break down the maintenance cost into its variable and fixed cost elements.

Required:

1. Estimate how much of the ¥17,625,000 factory overhead cost at the high level of activity consists of maintenance cost. (Hint: To do this, it may be helpful to first determine how much of the ¥17,625,000 consists of indirect materials and rent. Think about the behavior of variable and fixed costs!)
2. Using the high-low method, estimate a cost formula for maintenance.
3. What total factory overhead costs would you expect the company to incur at an operating level of 70,000 direct labor-hours?

PROBLEM 5-16A High-Low Method; Cost of Goods Manufactured [LO1, LO3]

Amfac Company manufactures a single product. The company keeps careful records of manufacturing activities from which the following information has been extracted:

CHECK FIGURE

- (2) \$30,000 per month plus \$8 per unit

	Level of Activity	
	March-Low	June-High
Number of units produced.....	6,000	9,000
Cost of goods manufactured.....	\$168,000	\$257,000
Work in process inventory, beginning.....	\$9,000	\$32,000
Work in process inventory, ending.....	\$15,000	\$21,000
Direct materials cost per unit	\$6	\$6
Direct labor cost per unit.....	\$10	\$10
Manufacturing overhead cost, total.....	?	?



The company's manufacturing overhead cost consists of both variable and fixed cost elements. To have data available for planning, management wants to determine how much of the overhead cost is variable with units produced and how much of it is fixed per month.

Required:

1. For both March and June, estimate the amount of manufacturing overhead cost added to production. The company had no underapplied or overapplied overhead in either month. (Hint: A useful way to proceed might be to construct a schedule of cost of goods manufactured.)
2. Using the high-low method, estimate a cost formula for manufacturing overhead. Express the variable portion of the formula in terms of a variable rate per unit of product.
3. If 7,000 units are produced during a month, what would be the cost of goods manufactured? (Assume that work in process inventories do not change and that there is no underapplied or overapplied overhead cost for the month.)

CHECK FIGURE

(2) \$9,000 per month plus
\$1.60 per machine-hour

PROBLEM 5-17A High-Low Method; Predicting Cost [LO1, LO3]

Nova Company's total overhead cost at various levels of activity are presented below:

Month	Machine-Hours	Total Overhead Cost
April.....	70,000	\$198,000
May.....	60,000	\$174,000
June.....	80,000	\$222,000
July.....	90,000	\$246,000

Assume that the total overhead cost above consists of utilities, supervisory salaries, and maintenance. The breakdown of these costs at the 60,000 machine-hour level of activity is:

Utilities (variable).....	\$ 48,000
Supervisory salaries (fixed).....	21,000
Maintenance (mixed).....	105,000
Total overhead cost.....	<u>\$174,000</u>

Nova Company's management wants to break down the maintenance cost into its variable and fixed cost elements.

Required:

1. Estimate how much of the \$246,000 of overhead cost in July was maintenance cost. (Hint: to do this, it may be helpful to first determine how much of the \$246,000 consisted of utilities and supervisory salaries. Think about the behavior of variable and fixed costs!)
2. Using the high-low method, estimate a cost formula for maintenance.
3. Express the company's total overhead cost in the linear equation form $Y = a + bX$.
4. What total overhead cost would you expect to be incurred at an operating activity level of 75,000 machine-hours?

BUILDING YOUR SKILLS



CASE [LO1, LO2, LO3]

Maria Chavez owns a catering company that serves food and beverages at parties and business functions. Chavez's business is seasonal, with a heavy schedule during the summer months and holidays and a lighter schedule at other times.

One of the major events Chavez's customers request is a cocktail party. She offers a standard cocktail party and has estimated the cost per guest as follows:

Food and beverages.....	\$15.00
Labor (0.5 hrs. @ \$10.00/hr.).....	5.00
Overhead (0.5 hrs. @ \$13.98/hr.).....	6.99
Total cost per guest.....	<u>\$26.99</u>

The standard cocktail party lasts three hours and Chavez hires one worker for every six guests, so that works out to one-half hour of labor per guest. These workers are hired only as needed and are paid only for the hours they actually work.

When bidding on cocktail parties, Chavez adds a 15% markup to yield a price of about \$31 per guest. She is confident about her estimates of the costs of food and beverages and labor but is not as comfortable with the estimate of overhead cost. The \$13.98 overhead cost per labor-hour was determined by dividing total overhead expenses for the last 12 months by total labor-hours for the same period. Monthly data concerning overhead costs and labor-hours follow:

Month	Labor-Hours	Overhead Expenses
January	2,500	\$ 55,000
February.....	2,800	59,000
March.....	3,000	60,000
April.....	4,200	64,000
May	4,500	67,000
June	5,500	71,000
July.....	6,500	74,000
August.....	7,500	77,000
September	7,000	75,000
October	4,500	68,000
November	3,100	62,000
December	6,500	73,000
Total	<u>57,600</u>	<u>\$805,000</u>

Chavez has received a request to bid on a 180-guest fund-raising cocktail party to be given next month by an important local charity. (The party would last the usual three hours.) She would like to win this contract because the guest list for this charity event includes many prominent individuals that she would like to land as future clients. Maria is confident that these potential customers would be favorably impressed by her company’s services at the charity event.

Required:

1. Estimate the contribution to profit of a standard 180-guest cocktail party if Chavez charges her usual price of \$31 per guest. (In other words, by how much would her overall profit increase?)
2. How low could Chavez bid for the charity event in terms of a price per guest and still not lose money on the event itself?
3. The individual who is organizing the charity’s fund-raising event has indicated that he has already received a bid under \$30 from another catering company. Do you think Chavez should bid below her normal \$31 per guest price for the charity event? Why or why not?

(CMA, adapted)

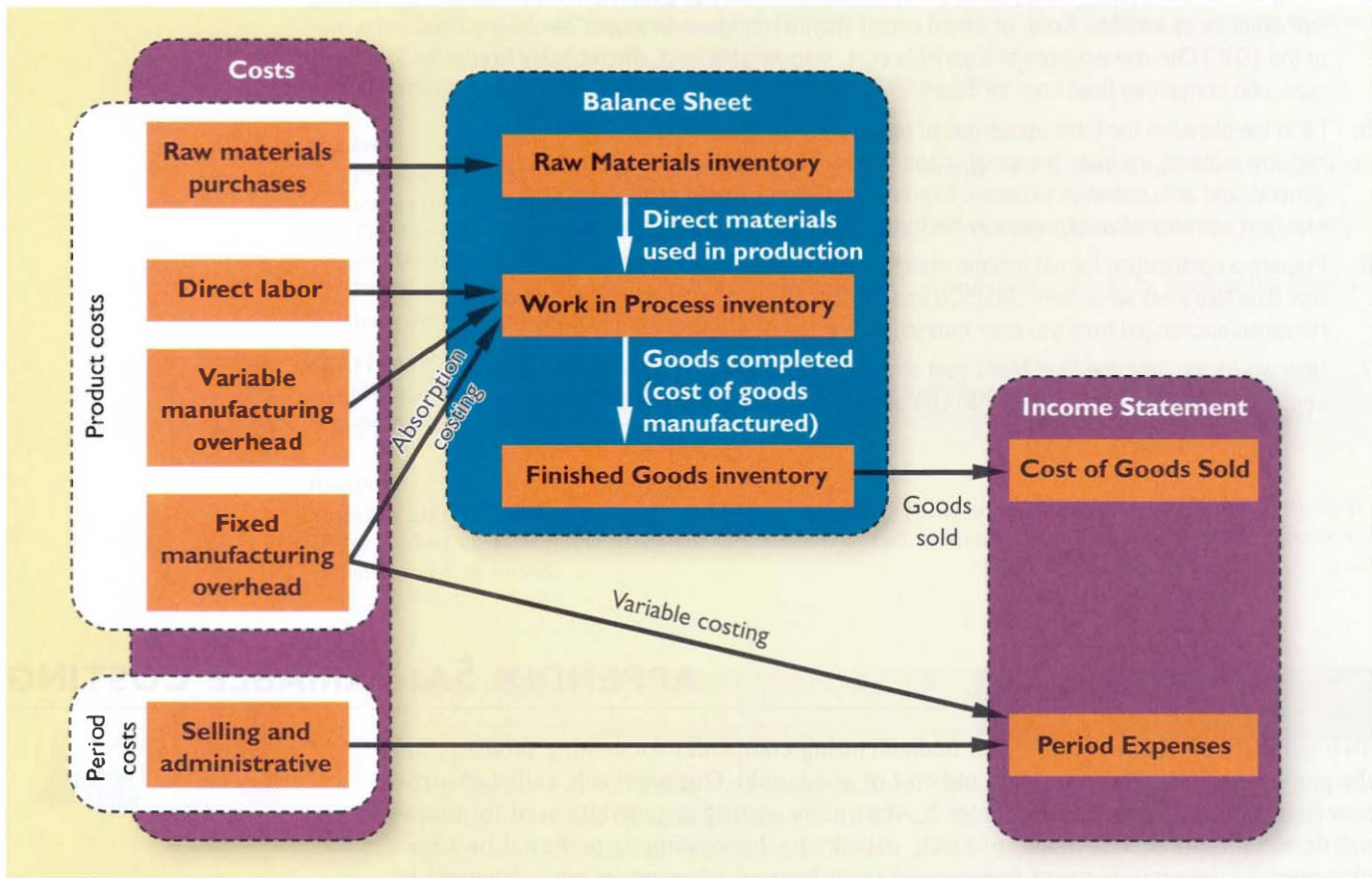
ANALYTICAL THINKING [LO2]

Angora Wraps of Pendleton, Oregon, makes fine sweaters out of pure angora wool. The business is seasonal, with the largest demand during the fall, the winter, and Christmas holidays. The company must increase production each summer to meet estimated demand.

The company has been analyzing its costs to determine which costs are fixed and variable for planning purposes. Below are data for the company’s activity and direct labor costs over the last year.



Month	Thousands of Units Produced	Number of Paid Days	Direct Labor Cost
January	98	20	\$14,162
February.....	76	20	\$12,994
March.....	75	21	\$15,184
April.....	75	22	\$15,038
May	85	22	\$15,768
June	102	21	\$15,330
July.....	52	19	\$13,724
August.....	136	21	\$14,162
September	138	22	\$15,476
October	132	23	\$15,476
November	86	18	\$12,972
December	56	21	\$14,074

EXHIBIT 5A-1 Variable Costing versus Absorption Costing

treated as a product cost under this method. Rather, fixed manufacturing overhead is treated as a period cost and, like selling and administrative expenses, it is expensed in its entirety each period. Consequently, the cost of a unit of product in inventory or in cost of goods sold under the variable costing method does not contain any fixed manufacturing overhead cost. Variable costing is sometimes referred to as *direct costing* or *marginal costing*.

Selling and Administrative Expense Selling and administrative expenses are never treated as product costs, regardless of the costing method. Thus, under absorption and variable costing, variable and fixed selling and administrative expenses are always treated as period costs and are expensed as incurred.

Summary of Differences The essential difference between variable costing and absorption costing, as illustrated in Exhibit 5A-1 above, is how each method accounts for fixed manufacturing overhead costs—all other costs are treated the same under the two methods. In absorption costing, fixed manufacturing overhead costs are included as part of the costs of work in process inventories. When units are completed, these costs are transferred to finished goods and only when the units are sold do these costs flow through to the income statement as part of cost of goods sold. In variable costing, fixed manufacturing overhead costs are considered to be period costs—just like selling and administrative costs—and are taken immediately to the income statement as period expenses.

To illustrate the difference between variable costing and absorption costing, consider Weber Light Aircraft, a company that produces light recreational aircraft. Data concerning the company's operations follows:

	Per Aircraft	Per Month
Selling price	\$100,000	
Direct materials	\$19,000	
Direct labor.....	\$5,000	
Variable manufacturing overhead.....	\$1,000	
Fixed manufacturing overhead		\$70,000
Variable selling and administrative expenses.....	\$10,000	
Fixed selling and administrative expenses		\$20,000

	January	February	March
Beginning inventory	0	0	1
Production.....	1	2	2
Sales	1	1	3
Ending inventory	0	1	0

We will first construct the company’s absorption costing income statements for January, February, and March. Then we will show how the company’s net operating income would be determined for the same months using variable costing.

Absorption Costing Income Statement To prepare the company’s absorption costing income statements for January, February, and March, we need to determine the company’s unit product costs, cost of goods sold, and selling and administrative expenses for each month.

The company’s absorption costing unit product costs can be computed as follows:¹

Absorption Costing Unit Product Cost			
	January	February	March
Direct materials.....	\$19,000	\$19,000	\$19,000
Direct labor.....	5,000	5,000	5,000
Variable manufacturing overhead.....	1,000	1,000	1,000
Fixed manufacturing overhead (\$70,000 ÷ 1 unit produced in January; \$70,000 ÷ 2 units produced in February; \$70,000 ÷ 2 units produced in March).....	<u>70,000</u>	<u>35,000</u>	<u>35,000</u>
Absorption costing unit product cost.....	<u>\$95,000</u>	<u>\$60,000</u>	<u>\$60,000</u>

Given these unit product costs, the cost of goods sold under absorption costing in each month would be determined as follows:

Absorption Costing Cost of Goods Sold			
	January	February	March
Absorption costing unit product cost (a).....	\$95,000	\$60,000	\$60,000
Units sold (b).....	1	1	3*
Absorption costing cost of goods sold (a) × (b).....	\$95,000	\$60,000	\$180,000

*One of the three units sold in March was produced in February. Since February and March both have unit product costs of \$60,000, the March unit product cost of \$60,000 can be multiplied by 3.

LEARNING OBJECTIVE 6

Prepare income statements using both variable and absorption costing.

¹For simplicity, we assume in this section that an actual costing system is used in which actual costs are spread over the units produced during the period. If a predetermined overhead rate were used, the analysis would be similar, but more complex.

And the company's selling and administrative expenses would be as follows:

Selling and Administrative Expenses			
	January	February	March
Variable selling and administrative expense (@ \$10,000 per unit sold)	\$10,000	\$10,000	\$30,000
Fixed selling and administrative expense	20,000	20,000	20,000
Total selling and administrative expense	<u>\$30,000</u>	<u>\$30,000</u>	<u>\$50,000</u>

Putting all of this together, the absorption costing income statements would appear as shown in Exhibit 5A-2.

EXHIBIT 5A-2
Absorption Costing Income
Statements

Absorption Costing Income Statements			
	January	February	March
Sales	\$100,000	\$100,000	\$300,000
Cost of goods sold	<u>95,000</u>	<u>60,000</u>	<u>180,000</u>
Gross margin	5,000	40,000	120,000
Selling and administrative expenses	30,000	30,000	50,000
Net operating income (loss)	<u>\$ (25,000)</u>	<u>\$ 10,000</u>	<u>\$ 70,000</u>

Note that even though sales were exactly the same in January and February and the cost structure did not change, net operating income was \$35,000 higher in February than in January under absorption costing.

Variable Costing Contribution Format Income Statement As discussed earlier, the only reason that absorption costing income differs from variable costing income is that the methods account for fixed manufacturing overhead differently. Under absorption costing, fixed manufacturing overhead is included in product costs. In variable costing, fixed manufacturing overhead is not included in product costs and instead is treated as a period expense, just like selling and administrative expenses.

Under variable costing, product costs consist solely of variable production costs. At Weber Light Aircraft, the variable production cost per unit is \$25,000, determined as follows:

Variable Costing Unit Product Cost	
Direct materials	\$19,000
Direct labor	5,000
Variable manufacturing overhead	<u>1,000</u>
Variable costing unit product cost	<u>\$25,000</u>

Since the variable production cost is \$25,000 per aircraft, the variable costing cost of goods sold can be easily computed as follows:

Variable Costing Cost of Goods Sold			
	January	February	March
Variable production cost (a)	\$25,000	\$25,000	\$25,000
Units sold (b)	1	1	3
Variable cost of goods sold (a) × (b)	\$25,000	\$25,000	\$75,000

Variable Costing Contribution Format Income Statements			
	January	February	March
Sales	\$100,000	\$100,000	\$300,000
Variable expenses:			
Variable cost of goods sold	25,000	25,000	75,000
Variable selling and administrative expense	10,000	10,000	30,000
Total variable expenses	35,000	35,000	105,000
Contribution margin	65,000	65,000	195,000
Fixed expenses:			
Fixed manufacturing overhead	70,000	70,000	70,000
Fixed selling and administrative expense	20,000	20,000	20,000
Total fixed expenses	90,000	90,000	90,000
Net operating income (loss)	<u>\$ (25,000)</u>	<u>\$ (25,000)</u>	<u>\$105,000</u>

EXHIBIT 5A-3
Variable Costing Income Statements

The selling and administrative expenses will be the same as the amounts reported using absorption costing. The only difference will be how those costs appear on the income statement.

The variable costing income statements for January, February, and March appear in Exhibit 5A-3. The contribution format has been used in these income statements.

Contrasting the absorption costing and variable costing income statements in Exhibits 5A-2 and 5A-3, note that net operating income is the same in January under absorption costing and variable costing, but differs in the other two months. We will discuss this in some depth shortly. Also note that the format of the variable costing income statement differs from the absorption costing income statement. An absorption costing income statement categorizes costs by function—manufacturing versus selling and administrative. All of the manufacturing costs flow through the absorption costing cost of goods sold and all of the selling and administrative costs are listed separately as period expenses. In contrast, in the contribution approach above, costs are categorized according to how they behave. All of the variable expenses are listed together and all of the fixed expenses are listed together. The variable expenses category includes manufacturing costs (i.e., variable cost of goods sold) as well as selling and administrative expenses. The fixed expenses category also includes both manufacturing costs and selling and administrative expenses.

Reconciliation of Variable Costing with Absorption Costing Income

As noted earlier, variable costing and absorption costing net operating incomes may not be the same. In the case of Weber Light Aircraft, the net operating incomes are the same in January, but differ in the other two months. These differences occur because under absorption costing some fixed manufacturing overhead is capitalized in inventories (i.e., included in product costs) rather than currently expensed on the income statement. If inventories increase during a period, under absorption costing some of the fixed manufacturing overhead of the current period will be *deferred* in ending inventories. For example, in February two aircraft were produced and each carried with it \$35,000 ($\$70,000 \div 2$ aircraft produced) in fixed manufacturing overhead. Since only one aircraft was sold, \$35,000 of this fixed manufacturing overhead was on the absorption costing income statement as part of cost of goods sold, but \$35,000 would have been on the balance sheet as part of finished goods inventories. In contrast, under variable costing *all* of the

LEARNING OBJECTIVE 7

Reconcile variable costing and absorption costing net operating incomes and explain why the two amounts differ.

\$70,000 of fixed manufacturing overhead appeared on the income statement as a period expense. Consequently, net operating income was higher under absorption costing than under variable costing by \$35,000 in February. This was reversed in March when two units were produced, but three were sold. In March, under absorption costing \$105,000 of fixed manufacturing overhead was included in cost of goods sold (\$35,000 for the unit produced in February and sold in March plus \$35,000 for each of the two units produced and sold in March), but only \$70,000 was recognized as a period expense under variable costing. Hence, the net operating income in March was \$35,000 lower under absorption costing than under variable costing.

In general, when the units produced exceed unit sales and hence inventories increase, net operating income is higher under absorption costing than under variable costing. This occurs because some of the fixed manufacturing overhead of the period is *deferred* in inventories under absorption costing. In contrast, when unit sales exceed the units produced and hence inventories decrease, net operating income is lower under absorption costing than under variable costing. This occurs because some of the fixed manufacturing overhead of previous periods is *released* from inventories under absorption costing. When the units produced and unit sales are equal, no change in inventories occurs and absorption costing and variable costing net operating incomes are the same.²

Variable costing and absorption costing net operating incomes can be reconciled by determining how much fixed manufacturing overhead was deferred in, or released from, inventories during the period.

Fixed Manufacturing Overhead Deferred in, or Released from, Inventories under Absorption Costing			
	January	February	March
Fixed manufacturing overhead in beginning inventories	\$0	\$ 0	\$ 35,000
Fixed manufacturing overhead in ending inventories	<u>0</u>	<u>35,000</u>	<u>0</u>
Fixed manufacturing overhead deferred in (released from) inventories.....	<u>\$0</u>	<u>\$35,000</u>	<u>\$(35,000)</u>




The reconciliation would then be reported in Exhibit 5A-4:

EXHIBIT 5A-4
Reconciliation of Variable Costing and Absorption Costing Net Operating Incomes

Reconciliation of Variable Costing and Absorption Costing Net Operating Incomes			
	January	February	March
Variable costing net operating income	\$(25,000)	\$(25,000)	\$105,000
Add (deduct) fixed manufacturing overhead deferred in (released from) inventory under absorption costing	<u>0</u>	<u>35,000</u>	<u>(35,000)</u>
Absorption costing net operating income.....	<u>\$(25,000)</u>	<u>\$ 10,000</u>	<u>\$ 70,000</u>

²These general statements about the relation between variable costing and absorption costing net operating income assume LIFO is used to value inventories. Even when LIFO is not used, the general statements tend to be correct.

EXHIBIT 5A-5 Comparative Income Effects—Absorption and Variable Costing

Relation between Production and Sales for the Period	Effect on Inventories	Relation between Absorption and Variable Costing Net Operating Incomes
Units produced = Units sold	No change in inventories 	Absorption costing net operating income = Variable costing net operating income
Units produced > Units sold	Inventories increase 	Absorption costing net operating income > Variable costing net operating income*
Units produced < Units sold	Inventories decrease 	Absorption costing net operating income < Variable costing net operating income†

*Net operating income is higher under absorption costing because fixed manufacturing overhead cost is *deferred* in inventory under absorption costing as inventories increase.
 †Net operating income is lower under absorption costing because fixed manufacturing overhead cost is *released* from inventory under absorption costing as inventories decrease.

Again note that the difference between variable costing net operating income and absorption costing net operating income is entirely due to the amount of fixed manufacturing overhead that is deferred in, or released from, inventories during the period under absorption costing. Changes in inventories affect absorption costing net operating income—they do not affect variable costing net operating income, providing that the cost structure is stable.

The reasons for differences between variable and absorption costing net operating incomes are summarized in Exhibit 5A-5. When the units produced equal the units sold, as in January for Weber Light Aircraft, absorption costing net operating income will equal variable costing net operating income. This occurs because when production equals sales, all of the fixed manufacturing overhead incurred in the current period flows through to the income statement under both methods. When the units produced exceed the units sold, absorption costing net operating income will exceed variable costing net operating income. This occurs because inventories have increased; therefore, under absorption costing some of the fixed manufacturing overhead incurred in the current period is deferred in ending inventories on the balance sheet, whereas under variable costing all of the fixed manufacturing overhead incurred in the current period flows through to the income statement. In contrast, when the units produced are less than the units sold, absorption costing net operating income will be less than variable costing net operating income. This occurs because inventories have decreased; therefore, under absorption costing fixed manufacturing overhead that had been deferred in inventories during a prior period flows through to the current period's income statement together with all of the fixed manufacturing overhead incurred during the current period. Under variable costing, just the fixed manufacturing overhead of the current period flows through to the income statement.

APPENDIX 5A SUMMARY

LO5 Explain how variable costing differs from absorption costing and compute unit product costs under each method.

Variable and absorption costing are alternative methods of determining unit product costs. Under variable costing, only variable manufacturing costs (direct materials, direct labor, and variable manufacturing overhead) are treated as product costs. Fixed manufacturing overhead is treated as a period cost and it is expensed on the income statement as incurred. By contrast, absorption costing treats fixed manufacturing overhead as a product cost, along with direct materials, direct labor, and variable overhead.

LO6 Prepare income statements using both variable and absorption costing.

The unit product costs under the two methods are different and so the cost of goods sold are different on the income statement. Additionally, fixed manufacturing overhead is expensed on the income statement under variable costing, but is included in unit product costs under absorption costing. Under both costing methods, selling and administrative expenses are treated as period costs and are expensed on the income statement as incurred.

LO7 Reconcile variable costing and absorption costing net operating incomes and explain why the two amounts differ.

Because absorption costing treats fixed manufacturing overhead as a product cost, a portion of fixed manufacturing overhead is assigned to each unit as it is produced. If units of product are unsold at the end of a period, then the fixed manufacturing overhead cost attached to those units is carried with them into the inventory account and deferred to a future period. When these units are later sold, the fixed manufacturing overhead cost attached to them is released from the inventory account and charged against income as part of cost of goods sold. Thus, under absorption costing, it is possible to defer a portion of the fixed manufacturing overhead cost from one period to a future period through the inventory account.

APPENDIX 5A REVIEW PROBLEM: CONTRASTING VARIABLE AND ABSORPTION COSTING

Dexter Corporation produces and sells a single product, a wooden hand loom for weaving small items such as scarves. Selected cost and operating data relating to the product for two years are given below:

Selling price per unit.....	\$50
Manufacturing costs:	
Variable per unit produced:	
Direct materials	\$11
Direct labor	\$6
Variable overhead	\$3
Fixed per year	\$120,000
Selling and administrative costs:	
Variable per unit sold	\$4
Fixed per year	\$70,000

	Year 1	Year 2
Units in beginning inventory	0	2,000
Units produced during the year	10,000	6,000
Units sold during the year	8,000	8,000
Units in ending inventory	2,000	0

Required:

1. Assume the company uses absorption costing.
 - a. Compute the unit product cost in each year.
 - b. Prepare an income statement for each year.
2. Assume the company uses variable costing.
 - a. Compute the unit product cost in each year.
 - b. Prepare an income statement for each year.
3. Reconcile the variable costing and absorption costing net operating incomes.

Solution to Review Problem

1. a. Under absorption costing, all manufacturing costs, variable and fixed, are included in unit product costs:

	Year 1	Year 2
Direct materials.....	\$11	\$11
Direct labor	6	6
Variable manufacturing overhead.....	3	3
Fixed manufacturing overhead		
(\$120,000 ÷ 10,000 units)	12	
(\$120,000 ÷ 6,000 units)	<u> </u>	<u>20</u>
Absorption costing unit product cost	<u>\$32</u>	<u>\$40</u>

- b. The absorption costing income statements follow:

	Year 1	Year 2
Sales (8,000 units × \$50 per unit)	\$400,000	\$400,000
Cost of goods sold (8,000 units × \$32 per unit); (2,000 units × \$32 per unit) + (6,000 units × \$40 per unit).....	<u>256,000</u>	<u>304,000</u>
Gross margin.....	144,000	96,000
Selling and administrative expenses (8,000 units × \$4 per unit + \$70,000)	<u>102,000</u>	<u>102,000</u>
Net operating income (loss)	<u>\$ 42,000</u>	<u>\$ (6,000)</u>

2. a. Under variable costing, only the variable manufacturing costs are included in unit product costs:

	Year 1	Year 2
Direct materials.....	\$11	\$11
Direct labor	6	6
Variable manufacturing overhead.....	<u>3</u>	<u>3</u>
Variable costing unit product cost	<u>\$20</u>	<u>\$20</u>

b. The variable costing income statements follow.

	Year 1		Year 2	
Sales (8,000 units × \$50 per unit)		\$400,000		\$400,000
Variable expenses:				
Variable cost of goods sold (8,000 units × \$20 per unit)	\$160,000		\$160,000	
Variable selling and administrative expenses (8,000 units × \$4 per unit)	<u>32,000</u>	<u>192,000</u>	<u>32,000</u>	<u>192,000</u>
Contribution margin		208,000		208,000
Fixed expenses:				
Fixed manufacturing overhead.....	120,000		120,000	
Fixed selling and administrative expenses	<u>70,000</u>	<u>190,000</u>	<u>70,000</u>	<u>190,000</u>
Net operating income		<u>\$ 18,000</u>		<u>\$ 18,000</u>

3. The reconciliation of the variable and absorption costing net operating incomes follows:

	Year 1	Year 2
Variable costing net operating income	\$18,000	\$18,000
Add fixed manufacturing overhead costs deferred in inventory under absorption costing (2,000 units × \$12 per unit)	24,000	
Deduct fixed manufacturing overhead costs released from inventory under absorption costing (2,000 units × \$12 per unit)		(24,000)
Absorption costing net operating income (loss).....	<u>\$42,000</u>	<u>\$ (6,000)</u>

APPENDIX 5A GLOSSARY

Absorption costing A costing method that includes all manufacturing costs—direct materials, direct labor, and both variable and fixed manufacturing overhead—in unit product costs. (p. 239)

Variable costing A costing method that includes only variable manufacturing costs—direct materials, direct labor, and variable manufacturing overhead—in unit product costs. (p. 239)

APPENDIX 5A QUESTIONS

- 5A-1 What is the basic difference between absorption costing and variable costing?
- 5A-2 Are selling and administrative expenses treated as product costs or as period costs under variable costing?
- 5A-3 Explain how fixed manufacturing overhead costs are shifted from one period to another under absorption costing.
- 5A-4 What are the arguments in favor of treating fixed manufacturing overhead costs as product costs?
- 5A-5 What are the arguments in favor of treating fixed manufacturing overhead costs as period costs?
- 5A-6 If the units produced and unit sales are equal, which method would you expect to show the higher net operating income, variable costing or absorption costing? Why?

- 5A-7 If the units produced exceed unit sales, which method would you expect to show the higher net operating income, variable costing or absorption costing? Why?
- 5A-8 If fixed manufacturing overhead costs are released from inventory under absorption costing, what does this tell you about the level of production in relation to the level of sales?
- 5A-9 Under absorption costing, how is it possible to increase net operating income without increasing sales?

Multiple-choice questions are provided on the text website at www.mhhe.com/brewer5e.



connect

APPENDIX 5A EXERCISES AND PROBLEMS

BRIEF EXERCISE 5A-1 Variable and Absorption Costing Unit Product Costs [LO5]

Ida Sidha Karya Company is a family-owned company located in the village of Gianyar on the island of Bali in Indonesia. The company produces a handcrafted Balinese musical instrument called a gamelan that is similar to a xylophone. The sounding bars are cast from brass and hand-filed to attain just the right sound. The bars are then mounted on an intricately hand-carved wooden base. The gamelans are sold for 850 (thousand) rupiahs. (The currency in Indonesia is the rupiah, which is denoted by Rp.) Selected data for the company's operations last year follow (all currency values are in thousands of rupiahs):

Units in beginning inventory	0
Units produced	250
Units sold	225
Units in ending inventory	25
Variable costs per unit:	
Direct materials	Rp100
Direct labor	Rp320
Variable manufacturing overhead	Rp40
Variable selling and administrative	Rp20
Fixed costs:	
Fixed manufacturing overhead	Rp60,000
Fixed selling and administrative	Rp20,000

Required:

1. Assume that the company uses absorption costing. Compute the unit product cost for one gamelan.
2. Assume that the company uses variable costing. Compute the unit product cost for one gamelan.

BRIEF EXERCISE 5A-2 Variable Costing Income Statement; Explanation of Difference in Net Operating Income [LO6]

Refer to the data in Brief Exercise 5A-1 for Ida Sidha Karya Company. The absorption costing income statement prepared by the company's accountant for last year appears below (all currency values are in thousands of rupiahs):



Sales	Rp191,250
Cost of goods sold	<u>157,500</u>
Gross margin	33,750
Selling and administrative expense	<u>24,500</u>
Net operating income	<u>Rp 9,250</u>

Required:

- Determine how much of the ending inventory consists of fixed manufacturing overhead cost deferred in inventory to the next period.
- Prepare an income statement for the year using variable costing. Explain the difference in net operating income between the two costing methods.

BRIEF EXERCISE 5A-3 Reconciliation of Absorption and Variable Costing Net Operating Incomes [LO7]

Jorgansen Lighting, Inc., manufactures heavy-duty street lighting systems for municipalities. The company uses variable costing for internal management reports and absorption costing for external reports to shareholders, creditors, and the government. The company has provided the following data:

	Year 1	Year 2	Year 3
Inventories:			
Beginning (units)	200	170	180
Ending (units)	170	180	220
Variable costing net operating income	\$1,080,400	\$1,032,400	\$996,400

The company's fixed manufacturing overhead per unit was constant at \$560 for all three years.

Required:

- Determine each year's absorption costing net operating income. Present your answer in the form of a reconciliation report as shown in Exhibit 5A-4.
- In Year 4, the company's variable costing net operating income was \$984,400 and its absorption costing net operating income was \$1,012,400. Did inventories increase or decrease during Year 4? How much fixed manufacturing overhead cost was deferred or released from inventory during Year 4?

EXERCISE 5A-4 Variable and Absorption Costing Unit Product Costs and Income Statements [LO5, LO6]

Lynch Company manufactures and sells a single product. The following costs were incurred during the company's first year of operations:

Variable costs per unit:	
Manufacturing:	
Direct materials	\$6
Direct labor	\$9
Variable manufacturing overhead	\$3
Variable selling and administrative	\$4
Fixed costs per year:	
Fixed manufacturing overhead	\$300,000
Fixed selling and administrative	\$190,000

During the year, the company produced 25,000 units and sold 20,000 units. The selling price of the company's product is \$50 per unit.

Required:

- Assume that the company uses absorption costing:
 - Compute the unit product cost.
 - Prepare an income statement for the year.
- Assume that the company uses variable costing:
 - Compute the unit product cost.
 - Prepare an income statement for the year.

EXERCISE 5A-5 Variable Costing Income Statement; Reconciliation [LO6, LO7]

Whitman Company has just completed its first year of operations. The company's absorption costing income statement for the year follows:

Whitman Company Income Statement	
Sales (35,000 units × \$25 per unit).....	\$875,000
Cost of goods sold (35,000 units × \$16 per unit).....	<u>560,000</u>
Gross margin	315,000
Selling and administrative expenses	<u>280,000</u>
Net operating income	<u>\$ 35,000</u>

The company's selling and administrative expenses consist of \$210,000 per year in fixed expenses and \$2 per unit sold in variable expenses. The \$16 per unit product cost given above is computed as follows:

Direct materials.....	\$ 5
Direct labor	6
Variable manufacturing overhead.....	1
Fixed manufacturing overhead (\$160,000 ÷ 40,000 units).....	<u>4</u>
Absorption costing unit product cost.....	<u>\$16</u>

Required:

1. Redo the company's income statement in the contribution format using variable costing.
2. Reconcile any difference between the net operating income on your variable costing income statement and the net operating income on the absorption costing income statement above.

EXERCISE 5A-6 Variable Costing Unit Product Cost and Income Statement; Break-Even [LO5, LO6]

Chuck Wagon Grills, Inc., makes a single product—a handmade specialty barbecue grill that it sells for \$210. Data for last year's operations follow:

Units in beginning inventory	0
Units produced	20,000
Units sold.....	19,000
Units in ending inventory	1,000
Variable costs per unit:	
Direct materials	\$ 50
Direct labor.....	80
Variable manufacturing overhead.....	20
Variable selling and administrative	<u>10</u>
Total variable cost per unit.....	<u>\$160</u>
Fixed costs:	
Fixed manufacturing overhead	\$700,000
Fixed selling and administrative.....	<u>285,000</u>
Total fixed costs	<u>\$985,000</u>

Required:

1. Assume that the company uses variable costing. Compute the unit product cost for one barbecue grill.
2. Assume that the company uses variable costing. Prepare a contribution format income statement for the year.

EXERCISE 5A-7 Absorption Costing Unit Product Cost and Income Statement [LO5, LO6]

Refer to the data in Exercise 5A-6 for Chuck Wagon Grills. Assume in this exercise that the company uses absorption costing.

Required:

1. Compute the unit product cost for one barbecue grill.
2. Prepare an income statement.

CHECK FIGURE

(1) Year 1 net operating income: \$40,000

PROBLEM 5A-8 Variable Costing Income Statement; Reconciliation [LO6, LO7]

During Heaton Company's first two years of operations, the company reported absorption costing net operating income as follows:

	Year 1	Year 2
Sales (@ \$25 per unit).....	\$1,000,000	\$1,250,000
Cost of goods sold (@ \$18 per unit).....	720,000	900,000
Gross margin.....	280,000	350,000
Selling and administrative expenses*.....	210,000	230,000
Net operating income.....	<u>\$ 70,000</u>	<u>\$ 120,000</u>

*\$2 per unit variable; \$130,000 fixed each year.

The company's \$18 unit product cost is computed as follows:

Direct materials.....	\$ 4
Direct labor.....	7
Variable manufacturing overhead.....	1
Fixed manufacturing overhead (\$270,000 ÷ 45,000 units).....	6
Absorption costing unit product cost.....	<u>\$18</u>

Forty percent of fixed manufacturing overhead consists of wages and salaries; the remainder consists of depreciation charges on production equipment and buildings.

Production and cost data for the two years are:

	Year 1	Year 2
Units produced.....	45,000	45,000
Units sold.....	40,000	50,000

Required:

1. Prepare a variable costing contribution format income statement for each year.
2. Reconcile the absorption costing and the variable costing net operating income figures for each year.

CHECK FIGURE

(1b) Net operating income: \$32,000

PROBLEM 5A-9 Variable and Absorption Costing Unit Product Costs and Income Statements; Explanation of Difference in Net Operating Income [LO5, LO6, LO7]

High Country, Inc., produces and sells many recreational products. The company has just opened a new plant to produce a folding camp cot that will be marketed throughout the United States. The following cost and revenue data relate to May, the first month of the plant's operation:



	A	B
1	Beginning inventory	0
2	Units produced	10,000
3	Units sold	8,000
4	Selling price per unit	\$75
5		
6	Selling and administrative expenses:	
7	Variable per unit	\$6
8	Fixed (total)	\$200,000
9	Manufacturing costs:	
10	Direct materials cost per unit	\$20
11	Direct labor cost per unit	\$8
12	Variable manufacturing overhead cost per unit	\$2
13	Fixed manufacturing overhead cost (total)	\$100,000
14		

Management is anxious to see how profitable the new camp cot will be and has asked that an income statement be prepared for May.

Required:

1. Assume that the company uses absorption costing.
 - a. Determine the unit product cost.
 - b. Prepare an income statement for May.
2. Assume that the company uses variable costing.
 - a. Determine the unit product cost.
 - b. Prepare a contribution format income statement for May.
3. Explain the reason for any difference in the ending inventory balances under the two costing methods and the impact of this difference on reported net operating income.

PROBLEM 5A-10 Absorption and Variable Costing: Production Constant, Sales Fluctuate [LO5, LO6, LO7]

Tami Tyler opened Tami's Creations, Inc., a small manufacturing company, at the beginning of the year. Getting the company through its first quarter of operations placed a considerable strain on Ms. Tyler's personal finances. The following income statement for the first quarter was prepared by a friend who has just completed a course in managerial accounting at State University.

CHECK FIGURE

- (1b) Net operating income: \$10,000;
- (3a) Net operating income: \$60,000



Tami's Creations, Inc. Income Statement For the Quarter Ended March 31		
Sales (28,000 units).....		\$1,120,000
Variable expenses:		
Variable cost of goods sold.....	\$462,000	
Variable selling and administrative	<u>168,000</u>	<u>630,000</u>
Contribution margin		490,000
Fixed expenses:		
Fixed manufacturing overhead	300,000	
Fixed selling and administrative.....	<u>200,000</u>	<u>500,000</u>
Net operating loss.....		<u>\$ (10,000)</u>

Ms. Tyler is discouraged over the loss shown for the quarter, particularly because she had planned to use the statement as support for a bank loan. Another friend, a CPA, insists that the company should be using absorption costing rather than variable costing and argues that if absorption costing had been used the company would probably have reported at least some profit for the quarter.

At this point, Ms. Tyler is manufacturing only one product, a swimsuit. Production and cost data relating to the swimsuit for the first quarter follow:

Units produced	30,000
Units sold.....	28,000
Variable costs per unit:	
Direct materials.....	\$3.50
Direct labor.....	\$12.00
Variable manufacturing overhead.....	\$1.00
Variable selling and administrative	\$6.00

Required:

1. Complete the following:
 - a. Compute the unit product cost under absorption costing.
 - b. Redo the company's income statement for the quarter using absorption costing.
 - c. Reconcile the variable and absorption costing net operating income (loss) figures.
2. Was the CPA correct in suggesting that the company really earned a "profit" for the quarter? Explain.

3. During the second quarter of operations, the company again produced 30,000 units but sold 32,000 units. (Assume no change in total fixed costs.)
 - a. Prepare a contribution format income statement for the quarter using variable costing.
 - b. Prepare an income statement for the quarter using absorption costing.
 - c. Reconcile the variable costing and absorption costing net operating incomes.

CHECK FIGURE

(2) Net operating
income: \$50,000

**PROBLEM 5A-1 | Comprehensive Problem with Labor Fixed [LO5, LO6, LO7]**

Far North Telecom, Ltd., of Ontario, has organized a new division to manufacture and sell specialty cellular telephones. The division's monthly costs are shown below:

Manufacturing costs:	
Variable costs per unit:	
Direct materials	\$48
Variable manufacturing overhead	\$2
Fixed manufacturing overhead costs (total)	\$360,000
Selling and administrative costs:	
Variable	12% of sales
Fixed (total)	\$470,000

Far North Telecom regards all of its workers as full-time employees and the company has a long-standing no layoff policy. Furthermore, production is highly automated. Accordingly, the company includes its labor costs in its fixed manufacturing overhead. The cellular phones sell for \$150 each. During September, the first month of operations, the following activity was recorded:

Units produced	12,000
Units sold	10,000

Required:

1. Compute the unit product cost under:
 - a. Absorption costing.
 - b. Variable costing.
2. Prepare an absorption costing income statement for September.
3. Prepare a contribution format income statement for September using variable costing.
4. Assume that the company must obtain additional financing in order to continue operations. As a member of top management, would you prefer to rely on the statement in (2) above or in (3) above when meeting with a group of prospective investors?
5. Reconcile the absorption costing and variable costing net operating incomes in (2) and (3) above.

6

Cost-Volume-Profit Relationships

<< A LOOK BACK

In Chapter 5 we described variable, fixed, and mixed costs and covered the methods that can be used to break a mixed cost into its variable and fixed components. We also introduced the contribution format income statement.

A LOOK AT THIS CHAPTER

Chapter 6 describes the basics of cost-volume-profit analysis, an essential tool for decision making. Cost-volume-profit analysis helps managers understand the interrelationships among cost, volume, and profit.

A LOOK AHEAD >>

Chapter 7 describes the budgeting process.

CHAPTER OUTLINE

The Basics of Cost-Volume-Profit (CVP) Analysis

- Contribution Margin
- CVP Relationships in Equation Form
- CVP Relationships in Graphic Form
- Contribution Margin Ratio (CM Ratio)
- Some Applications of CVP Concepts

Target Profit and Break-Even Analysis

- Target Profit Analysis
- Break-Even Analysis
- The Margin of Safety

CVP Considerations in Choosing a Cost Structure

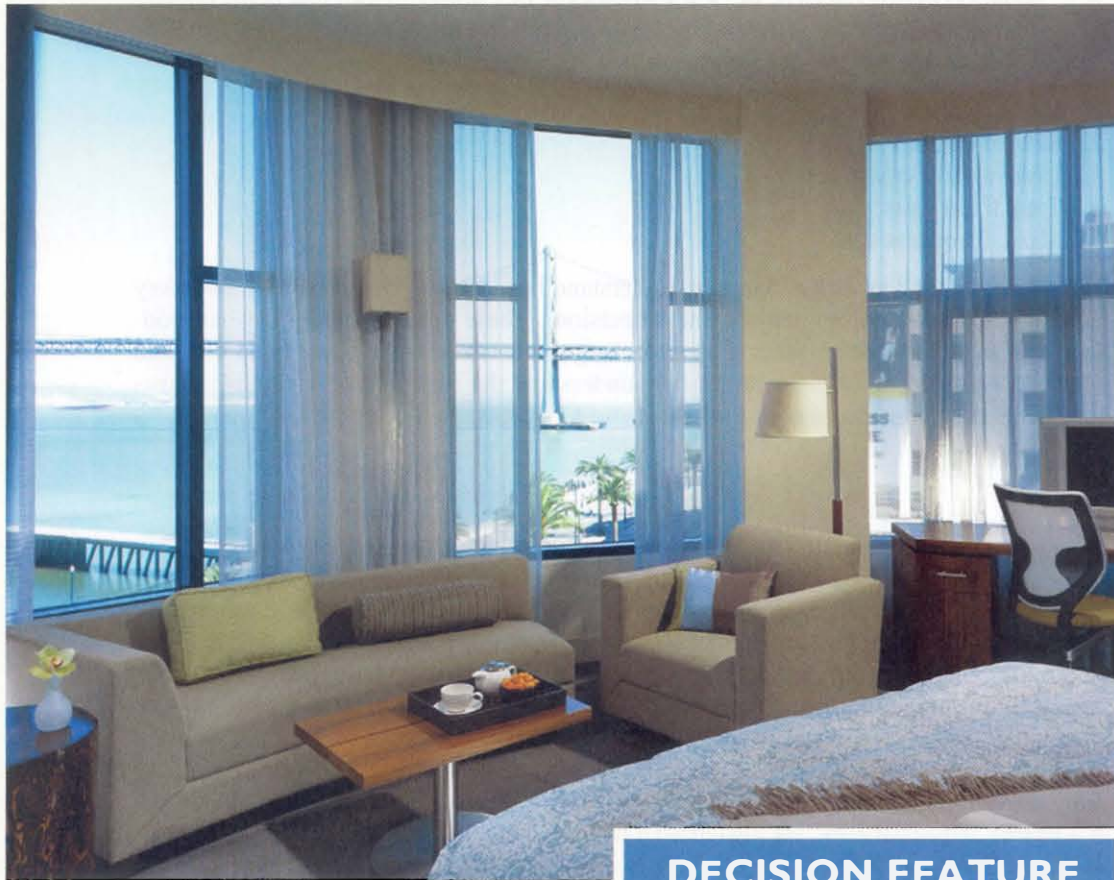
- Cost Structure and Profit Stability
- Operating Leverage

Structuring Sales Commissions

Sales Mix

- The Definition of Sales Mix
- Sales Mix and Break-Even Analysis

Assumptions of CVP Analysis



DECISION FEATURE

What Happened to the Profit?



Chip Conley is CEO of **Joie de Vivre Hospitality**, a company that owns and operates 28 hospitality businesses in northern California. Conley summed up the company's experience after the dot.com crash and 9/11 as follows: "In the history of American hotel markets, no hotel market has ever seen a drop in revenues as precipitous as the one in San Francisco and Silicon Valley in the last two years. On average, hotel revenues . . . dropped 40% to 45%. . . . We've been fortunate that our breakeven point is lower than our competition's. . . . But the problem is that the hotel business is a fixed-cost business. So in an environment where you have those precipitous drops and our costs are moderately fixed, our net incomes—well, they're not incomes anymore, they're losses."

Source: Karen Dillon, "Shop Talk," *Inc.* magazine, December 2002, pp. 111–114.

LEARNING OBJECTIVES



After studying Chapter 6, you should be able to:

- LO1** Explain how changes in activity affect contribution margin and net operating income.
- LO2** Prepare and interpret a cost-volume-profit (CVP) graph and a profit graph.
- LO3** Use the contribution margin ratio (CM ratio) to compute changes in contribution margin and net operating income resulting from changes in sales volume.
- LO4** Show the effects on contribution margin of changes in variable costs, fixed costs, selling price, and volume.
- LO5** Determine the level of sales needed to achieve a desired target profit.
- LO6** Determine the break-even point.
- LO7** Compute the margin of safety and explain its significance.
- LO8** Compute the degree of operating leverage at a particular level of sales and explain how it can be used to predict changes in net operating income.
- LO9** Compute the break-even point for a multiproduct company and explain the effects of shifts in the sales mix on contribution margin and the break-even point.

Cost-volume-profit (CVP) analysis is a powerful tool that helps managers understand the relationships among cost, volume, and profit. CVP analysis focuses on how profits are affected by the following five factors:

1. Selling prices.
2. Sales volume.
3. Unit variable costs.
4. Total fixed costs.
5. Mix of products sold.

Because CVP analysis helps managers understand how profits are affected by these key factors, it is a vital tool in many business decisions. These decisions include what products and services to offer, what prices to charge, what marketing strategy to use, and what cost structure to implement. To help understand the role of CVP analysis in business decisions, consider the case of Acoustic Concepts, Inc., a company founded by Prem Narayan.

MANAGERIAL ACCOUNTING IN ACTION

The Issue



Prem, who was a graduate student in engineering at the time, started Acoustic Concepts to market a radical new speaker he had designed for automobile sound systems. The speaker, called the Sonic Blaster, uses an advanced microprocessor and proprietary software to boost amplification to awesome levels. Prem contracted with a Taiwanese electronics manufacturer to produce the speaker. With seed money provided by his family, Prem placed an order with the manufacturer and ran advertisements in auto magazines.

The Sonic Blaster was an almost immediate success, and sales grew to the point that Prem moved the company's headquarters out of his apartment and into rented quarters in a nearby industrial park. He also hired a receptionist, an accountant, a sales manager, and a small sales staff to sell the speakers to retail stores. The accountant, Bob Luchinni, had worked for several small companies where he had acted as a business advisor as well as accountant and bookkeeper. The following discussion occurred soon after Bob was hired:

Prem: Bob, I've got a lot of questions about the company's finances that I hope you can help answer.

Bob: We're in great shape. The loan from your family will be paid off within a few months.

Prem: I know, but I am worried about the risks I've taken on by expanding operations. What would happen if a competitor entered the market and our sales slipped? How far could sales drop without putting us into the red? Another question I've been trying to resolve is how much our sales would have to increase to justify the big marketing campaign the sales staff is pushing for.

Bob: Marketing always wants more money for advertising.

Prem: And they are always pushing me to drop the selling price on the speaker. I agree with them that a lower price will boost our volume, but I'm not sure the increased volume will offset the loss in revenue from the lower price.

Bob: It sounds like these questions are all related in some way to the relationships among our selling prices, our costs, and our volume. I shouldn't have a problem coming up with some answers.

Prem: Can we meet again in a couple of days to see what you have come up with?

Bob: Sounds good. By then I'll have some preliminary answers for you as well as a model you can use for answering similar questions in the future.

THE BASICS OF COST-VOLUME-PROFIT (CVP) ANALYSIS

Bob Luchinni’s preparation for his forthcoming meeting with Prem begins where our study of cost behavior in the preceding chapter left off—with the contribution income statement. The contribution income statement emphasizes the behavior of costs and therefore is extremely helpful to managers in judging the impact on profits of changes in selling price, cost, or volume. Bob will base his analysis on the following contribution income statement he prepared last month:

Acoustic Concepts, Inc. Contribution Income Statement For the Month of June		
	Total	Per Unit
Sales (400 speakers)	\$100,000	\$250
Variable expenses	60,000	150
Contribution margin	40,000	\$100
Fixed expenses.....	35,000	
Net operating income	\$ 5,000	

Notice that sales, variable expenses, and contribution margin are expressed on a per unit basis as well as in total on this contribution income statement. The per unit figures will be very helpful to Bob in some of his calculations. Note that this contribution income statement has been prepared for management’s use inside the company and would not ordinarily be made available to those outside the company.

Contribution Margin

As explained in the previous chapter, contribution margin is the amount remaining from sales revenue after variable expenses have been deducted. Thus, it is the amount available to cover fixed expenses and then to provide profits for the period. Notice the sequence here—contribution margin is used *first* to cover the fixed expenses, and then whatever remains goes toward profits. If the contribution margin is not sufficient to cover the fixed expenses, then a loss occurs for the period. To illustrate with an extreme example, assume that Acoustic Concepts sells only one speaker during a particular month. The company’s income statement would appear as follows:

Contribution Income Statement Sales of 1 Speaker		
	Total	Per Unit
Sales (1 speaker)	\$ 250	\$250
Variable expenses	150	150
Contribution margin	100	\$100
Fixed expenses.....	35,000	
Net operating loss.....	\$(34,900)	

For each additional speaker the company sells during the month, \$100 more in contribution margin becomes available to help cover the fixed expenses. If a second speaker is

LEARNING OBJECTIVE I

Explain how changes in activity affect contribution margin and net operating income.



sold, for example, then the total contribution margin will increase by \$100 (to a total of \$200) and the company's loss will decrease by \$100, to \$34,800):

Contribution Income Statement Sales of 2 Speakers		
	Total	Per Unit
Sales (2 speakers)	\$ 500	\$250
Variable expenses	300	150
Contribution margin	200	<u>\$100</u>
Fixed expenses.....	35,000	
Net operating loss.....	<u>\$(34,800)</u>	

If enough speakers can be sold to generate \$35,000 in contribution margin, then all of the fixed expenses will be covered and the company will *break even* for the month—that is, it will show neither profit nor loss but just cover all of its costs. To reach the break-even point, the company will have to sell 350 speakers in a month because each speaker sold yields \$100 in contribution margin:

Contribution Income Statement Sales of 350 Speakers		
	Total	Per Unit
Sales (350 speakers)	\$87,500	\$250
Variable expenses	52,500	150
Contribution margin	35,000	<u>\$100</u>
Fixed expenses.....	35,000	
Net operating income	<u>\$ 0</u>	

Computation of the break-even point is discussed in detail later in the chapter; for the moment, note that the **break-even point** is the level of sales at which profit is zero.

Once the break-even point has been reached, net operating income will increase by the amount of the unit contribution margin for each additional unit sold. For example, if 351 speakers are sold in a month, then the net operating income for the month will be \$100 because the company will have sold 1 speaker more than the number needed to break even:

Contribution Income Statement Sales of 351 Speakers		
	Total	Per Unit
Sales (351 speakers)	\$87,750	\$250
Variable expenses	52,650	150
Contribution margin	35,100	<u>\$100</u>
Fixed expenses.....	35,000	
Net operating income	<u>\$ 100</u>	

If 352 speakers are sold (2 speakers above the break-even point), the net operating income for the month will be \$200. If 353 speakers are sold (3 speakers above the

break-even point), the net operating income for the month will be \$300, and so forth. To estimate the profit at any sales volume above the break-even point, simply multiply the number of units sold in excess of the break-even point by the unit contribution margin. The result represents the anticipated profits for the period. Or, to estimate the effect of a planned increase in sales on profits, simply multiply the increase in units sold by the unit contribution margin. The result will be the expected increase in profits. To illustrate, if Acoustic Concepts is currently selling 400 speakers per month and plans to increase sales to 425 speakers per month, the anticipated impact on profits can be computed as follows:

Increased number of speakers to be sold	25
Contribution margin per speaker	× \$100
Increase in net operating income	<u>\$2,500</u>

These calculations can be verified as follows:

	Sales Volume			Per Unit
	400 Speakers	425 Speakers	Difference (25 Speakers)	
Sales (@ \$250 per speaker)	\$100,000	\$106,250	\$6,250	\$250
Variable expenses (@ \$150 per speaker)	<u>60,000</u>	<u>63,750</u>	<u>3,750</u>	<u>150</u>
Contribution margin	40,000	42,500	2,500	<u>\$100</u>
Fixed expenses	35,000	35,000	0	
Net operating income	<u>\$ 5,000</u>	<u>\$ 7,500</u>	<u>\$2,500</u>	

To summarize, if sales are zero, the company’s loss would equal its fixed expenses. Each unit that is sold reduces the loss by the amount of the unit contribution margin. Once the break-even point has been reached, each additional unit sold increases the company’s profit by the amount of the unit contribution margin.

CVP Relationships in Equation Form

The contribution format income statement can be expressed in equation form as follows:

$$\text{Profit} = (\text{Sales} - \text{Variable expenses}) - \text{Fixed expenses}$$

For brevity, we use the term profit to stand for net operating income in equations.

When a company has only a *single* product, as at Acoustic Concepts, we can further refine the equation as follows:

$$\text{Sales} = \text{Selling price per unit} \times \text{Quantity sold} = P \times Q$$

$$\text{Variable expenses} = \text{Variable expenses per unit} \times \text{Quantity sold} = V \times Q$$

$$\text{Profit} = (P \times Q - V \times Q) - \text{Fixed expenses}$$

We can do all of the calculations of the previous section using this simple equation. For example, on page 260 we computed that the net operating income (profit) at sales of

351 speakers would be \$100. We can arrive at the same conclusion using the above equation as follows:

$$\begin{aligned}\text{Profit} &= (P \times Q - V \times Q) - \text{Fixed expenses} \\ \text{Profit} &= (\$250 \times 351 - \$150 \times 351) - \$35,000 \\ &= (\$250 - \$150) \times 351 - \$35,000 \\ &= (\$100) \times 351 - \$35,000 \\ &= \$35,100 - \$35,000 = \$100\end{aligned}$$

It is often useful to express the simple profit equation in terms of the unit contribution margin (Unit CM) as follows:

$$\text{Unit CM} = \text{Selling price per unit} - \text{Variable expenses per unit} = P - V$$

$$\text{Profit} = (P \times Q - V \times Q) - \text{Fixed expenses}$$

$$\text{Profit} = (P - V) \times Q - \text{Fixed expenses}$$

$$\text{Profit} = \text{Unit CM} \times Q - \text{Fixed expenses}$$

We could also have used this equation to determine the profit at sales of 351 speakers as follows:

$$\begin{aligned}\text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expenses} \\ &= \$100 \times 351 - \$35,000 \\ &= \$35,100 - \$35,000 = \$100\end{aligned}$$

For those who are comfortable with algebra, the quickest and easiest approach to solving the problems in this chapter may be to use the simple profit equation in one of its forms.

CVP Relationships in Graphic Form

LEARNING OBJECTIVE 2

Prepare and interpret a cost-volume-profit (CVP) graph and a profit graph.

The relationships among revenue, cost, profit, and volume are illustrated on a **cost-volume-profit (CVP) graph**. A CVP graph highlights CVP relationships over wide ranges of activity. To help explain his analysis to Prem Narayan, Bob Luchinni prepared a CVP graph for Acoustic Concepts.



Preparing the CVP Graph In a CVP graph (sometimes called a *break-even chart*), unit volume is represented on the horizontal (X) axis and dollars on the vertical (Y) axis. Preparing a CVP graph involves three steps as depicted in Exhibit 6-1:

1. Draw a line parallel to the volume axis to represent total fixed expense. For Acoustic Concepts, total fixed expenses are \$35,000.
2. Choose some volume of unit sales and plot the point representing total expense (fixed and variable) at the sales volume you have selected. In Exhibit 6-1, Bob Luchinni chose a volume of 600 speakers. Total expense at that sales volume is:

Fixed expense	\$ 35,000
Variable expense (600 speakers \times \$150 per speaker)	90,000
Total expense	<u>\$125,000</u>

After the point has been plotted, draw a line through it back to the point where the fixed expense line intersects the dollars axis.

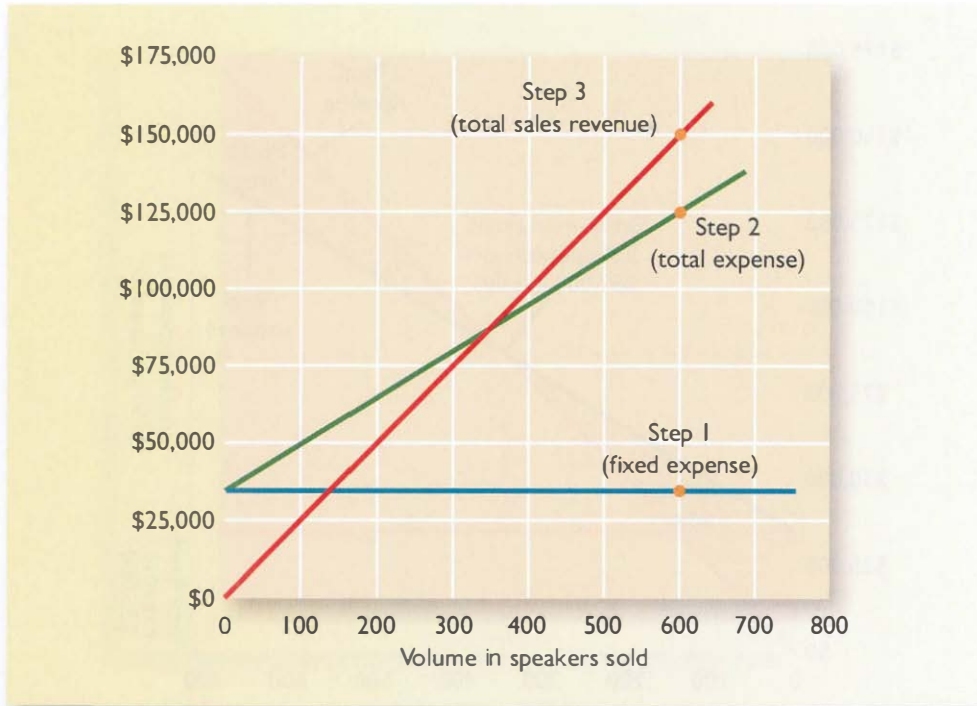


EXHIBIT 6-1
Preparing the CVP Graph

- Again choose some sales volume and plot the point representing total sales dollars at the activity level you have selected. In Exhibit 6-1, Bob Luchinni again chose a volume of 600 speakers. Sales at that sales volume total \$150,000 (600 speakers \times \$250 per speaker). Draw a line through this point back to the origin.

The interpretation of the completed CVP graph is given in Exhibit 6-2. The anticipated profit or loss at any given level of sales is measured by the vertical distance between the total revenue line (sales) and the total expense line (variable expense plus fixed expense).

The break-even point is where the total revenue and total expense lines cross. The break-even point of 350 speakers in Exhibit 6-2 agrees with the break-even point computed earlier.

As discussed earlier, when sales are below the break-even point—in this case, 350 units—the company suffers a loss. Note that the loss (represented by the vertical distance between the total expense and total revenue lines) gets bigger as sales decline. When sales are above the break-even point, the company earns a profit and the size of the profit (represented by the vertical distance between the total revenue and total expense lines) increases as sales increase.

An even simpler form of the CVP graph, which we call a profit graph, is presented in Exhibit 6-3. That graph is based on the following equation:

$$\text{Profit} = \text{Unit CM} \times Q - \text{Fixed expenses}$$

In the case of Acoustic Concepts, the equation can be expressed as:

$$\text{Profit} = \$100 \times Q - \$35,000$$

Because this is a linear equation, it plots as a single straight line. To plot the line, compute the profit at two different sales volumes, plot the points, and then connect them with a straight line. For example, when the sales volume is zero (i.e., $Q = 0$), the profit is $-\$35,000$ ($= \$100 \times 0 - \$35,000$). When Q is 600, the profit is $\$25,000$ ($= \$100 \times 600 - \$35,000$). These two points are plotted in Exhibit 6-3 and a straight line has been drawn through them.

EXHIBIT 6-2
The Completed CVP Graph

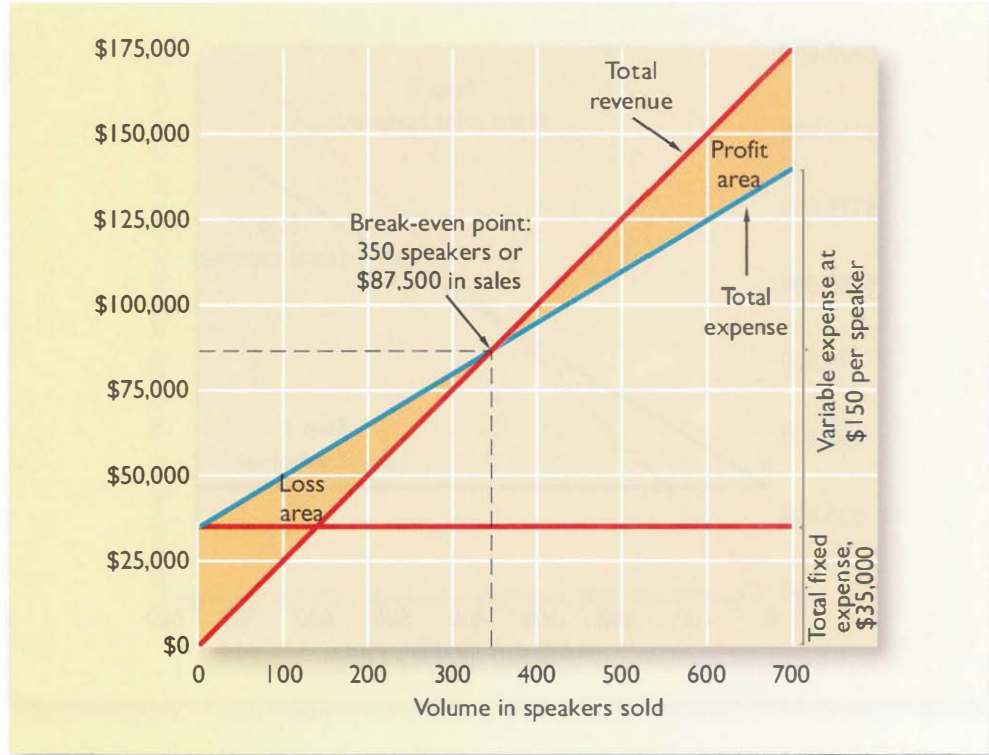
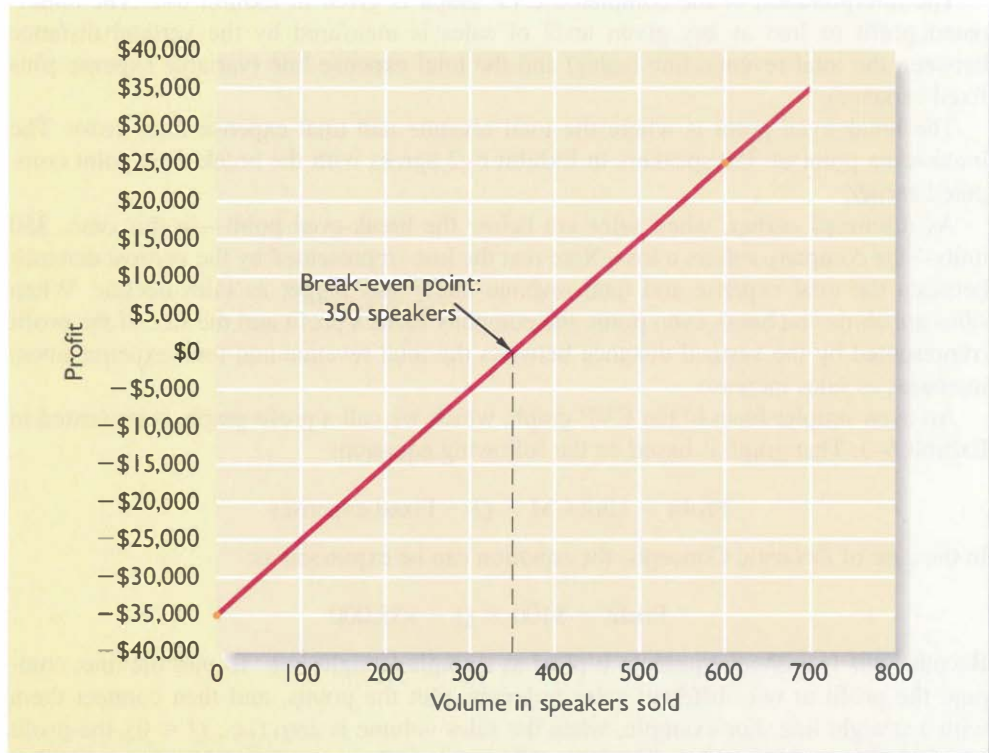


EXHIBIT 6-3
The Profit Graph



The break-even point on the profit graph is the volume of sales at which profit is zero and is indicated by the dashed line on the graph. Note that the profit steadily increases to the right of the break-even point as the sales volume increases and that the loss becomes steadily worse to the left of the break-even point as the sales volume decreases.

Contribution Margin Ratio (CM Ratio)

In the previous section, we explored how cost-volume-profit relationships can be visualized. In this section, we show how the *contribution margin ratio* can be used in cost-volume-profit calculations. As the first step, we have added a column to Acoustic Concepts' contribution format income statement in which sales revenues, variable expenses, and contribution margin are expressed as a percentage of sales:

	Total	Per Unit	Percent of Sales
Sales (400 speakers)	\$100,000	\$250	100%
Variable expenses	60,000	150	60%
Contribution margin	40,000	<u>\$100</u>	<u>40%</u>
Fixed expenses.....	35,000		
Net operating income	<u>\$ 5,000</u>		

LEARNING OBJECTIVE 3

Use the contribution margin ratio (CM ratio) to compute changes in contribution margin and net operating income resulting from changes in sales volume.



The contribution margin as a percentage of sales is referred to as the **contribution margin ratio (CM ratio)**. This ratio is computed as follows:

$$\text{CM ratio} = \frac{\text{Contribution margin}}{\text{Sales}}$$

For Acoustic Concepts, the computations are:

$$\text{CM ratio} = \frac{\text{Total contribution margin}}{\text{Total sales}} = \frac{\$40,000}{\$100,000} = 40\%$$

In a company such as Acoustic Concepts that has only one product, the CM ratio can also be computed on a per unit basis as follows:

$$\text{CM ratio} = \frac{\text{Unit contribution margin}}{\text{Unit selling price}} = \frac{\$100}{\$250} = 40\%$$

The CM ratio shows how the contribution margin will be affected by a change in total sales. Acoustic Concepts' CM ratio of 40% means that for each dollar increase in sales, total contribution margin will increase by 40 cents (\$1 sales × CM ratio of 40%). Net operating income will also increase by 40 cents, assuming that fixed costs are not affected by the increase in sales.

As this illustration suggests, *the impact on net operating income of any given dollar change in total sales can be computed by simply applying the CM ratio to the dollar change*. For example, if Acoustic Concepts plans a \$30,000 increase in sales during the coming month, the contribution margin should increase by \$12,000 (\$30,000 increase in sales \times CM ratio of 40%). As we noted above, net operating income will also increase by \$12,000 if fixed costs do not change. This is verified by the following table:

	Sales Volume			Percent of Sales
	Present	Expected	Increase	
Sales.....	\$100,000	\$130,000	\$30,000	100%
Variable expenses	60,000	78,000*	18,000	60%
Contribution margin.....	40,000	52,000	12,000	40%
Fixed expenses	35,000	35,000	0	
Net operating income.....	\$ 5,000	\$ 17,000	\$12,000	

*\$130,000 expected sales \div \$250 per unit = 520 units. 520 units \times \$150 per unit = \$78,000.

The relation between profit and the CM ratio can also be expressed using the following equation:

$$\text{Profit} = \text{CM ratio} \times \text{Sales} - \text{Fixed expenses}^*$$

*This equation can be derived using the basic profit equation and the definition of the CM ratio as follows:

$$\text{Profit} = (\text{Sales} - \text{Variable expenses}) - \text{Fixed expenses}$$

$$\text{Profit} = \text{Contribution margin} - \text{Fixed expenses}$$

$$\text{Profit} = \frac{\text{Contribution margin}}{\text{Sales}} \times \text{Sales} - \text{Fixed expense}$$

$$\text{Profit} = \text{CM ratio} \times \text{Sales} - \text{Fixed expenses}$$

For example, at sales of \$130,000, the profit is expected to be \$17,000 as shown below:

$$\begin{aligned} \text{Profit} &= \text{CM ratio} \times \text{Sales} - \text{Fixed expenses} \\ &= 0.40 \times \$130,000 - \$35,000 \\ &= \$52,000 - \$35,000 = \$17,000 \end{aligned}$$

Again, if you are comfortable with algebra, this approach will often be quicker and easier than constructing contribution format income statements.

The CM ratio is particularly valuable in situations where the dollar sales of one product must be traded off against the dollar sales of another product. In this situation, products that yield the greatest amount of contribution margin per dollar of sales should be emphasized.

1. The contribution margin ratio always increases when (you may select more than one answer):
 - a. Sales increase.
 - b. Fixed costs decrease.
 - c. Total variable costs decrease.
 - d. Variable costs as a percent of sales decrease.



Some Applications of CVP Concepts

Bob Luchinni, the accountant at Acoustic Concepts, wanted to demonstrate to the company's president Prem Narayan how the concepts developed on the preceding pages can be used in planning and decision making. Bob gathered the following basic data:

	Per Unit	Percent of Sales
Selling price	\$250	100%
Variable expenses	150	60%
Contribution margin	<u>\$100</u>	<u>40%</u>

LEARNING OBJECTIVE 4

Show the effects on contribution margin of changes in variable costs, fixed costs, selling price, and volume.



Recall that fixed expenses are \$35,000 per month. Bob Luchinni will use these data to show the effects of changes in variable costs, fixed costs, sales price, and sales volume on the company's profitability in a variety of situations.

Before proceeding further, however, we need to introduce another concept—the *variable expense ratio*. The **variable expense ratio** is the ratio of variable expenses to sales. It can be computed by dividing the total variable expenses by the total sales, or in a single product analysis, it can be computed by dividing the variable expenses per unit by the unit selling price. In the case of Acoustic Concepts, the variable expense ratio is 0.60; that is, variable expense is 60% of sales.

Change in Fixed Cost and Sales Volume Acoustic Concepts is currently selling 400 speakers per month at \$250 per speaker for total monthly sales of \$100,000. The sales manager feels that a \$10,000 increase in the monthly advertising budget would increase monthly sales by \$30,000 to a total of 520 units. Should the advertising budget be increased? The following table shows the financial impact of the proposed change in the monthly advertising budget:

	Current Sales	Sales with Additional Advertising Budget	Difference	Percent of Sales
Sales.....	\$100,000	\$130,000	\$30,000	100%
Variable expenses	60,000	78,000*	18,000	60%
Contribution margin	40,000	52,000	12,000	40%
Fixed expenses	35,000	45,000 [†]	10,000	
Net operating income	<u>\$ 5,000</u>	<u>\$ 7,000</u>	<u>\$ 2,000</u>	

*520 units × \$150 per unit = \$78,000.
[†]\$35,000 + additional \$10,000 monthly advertising budget = \$45,000.

Assuming no other factors need to be considered, the increase in the advertising budget should be approved because it would increase net operating income by \$2,000. There are two shorter ways to arrive at this solution. The first alternative solution follows:

Alternative Solution 1

Expected total contribution margin:	
\$130,000 × 40% CM ratio	\$52,000
Present total contribution margin:	
\$100,000 × 40% CM ratio	<u>40,000</u>
Incremental contribution margin	12,000
Change in fixed expenses:	
Less incremental advertising expense	<u>10,000</u>
Increased net operating income	<u>\$ 2,000</u>

Because in this case only the fixed costs and the sales volume change, the solution can be presented in an even shorter format, as follows:

Alternative Solution 2

Incremental contribution margin:	
\$30,000 × 40% CM ratio	\$12,000
Less incremental advertising expense	<u>10,000</u>
Increased net operating income	<u>\$ 2,000</u>

Notice that this approach does not depend on knowledge of previous sales. Also note that it is unnecessary under either shorter approach to prepare an income statement. Both of the alternative solutions involve an **incremental analysis**—they consider only those items of revenue, cost, and volume that will change if the new program is implemented. Although in each case a new income statement could have been prepared, the incremental approach is simpler and more direct and focuses attention on the specific changes that would occur as a result of the decision.

Change in Variable Costs and Sales Volume Refer to the original data. Recall that Acoustic Concepts is currently selling 400 speakers per month. Prem is considering the use of higher-quality components, which would increase variable costs (and thereby reduce the contribution margin) by \$10 per speaker. However, the sales manager predicts that using higher-quality components would increase sales to 480 speakers per month. Should the higher-quality components be used?

The \$10 increase in variable costs would decrease the unit contribution margin by \$10—from \$100 down to \$90.

Solution

Expected total contribution margin with higher-quality components:	
480 speakers × \$90 per speaker	\$43,200
Present total contribution margin:	
400 speakers × \$100 per speaker	<u>40,000</u>
Increase in total contribution margin	<u>\$ 3,200</u>

According to this analysis, the higher-quality components should be used. Because fixed costs would not change, the \$3,200 increase in contribution margin shown above should result in a \$3,200 increase in net operating income.

Growing Sales at Amazon.com

IN BUSINESS

Amazon.com was deciding between two tactics for growing sales and profits. The first approach was to invest in television advertising. The second approach was to offer free shipping on larger orders. To evaluate the first option, Amazon.com invested in television ads in two markets—Minneapolis, Minnesota, and Portland, Oregon. The company quantified the profit impact of this choice by subtracting the increase in fixed advertising costs from the increase in contribution margin. The profit impact of television advertising paled in comparison to the free “super saver shipping” program, which the company introduced on orders over \$99. In fact, the free shipping option proved to be so popular and profitable that within two years Amazon.com dropped its qualifying threshold to \$49 and then again to a mere \$25. At each stage of this progression, Amazon.com used cost-volume-profit analysis to determine whether the extra volume from liberalizing the free shipping offer more than offset the associated increase in shipping costs.

Source: Rob Walker, “Because ‘Optimism Is Essential,’” *Inc.* magazine, April 2004 pp. 149–150.

Change in Fixed Cost, Sales Price, and Sales Volume Refer to the original data and recall again that Acoustic Concepts is currently selling 400 speakers per month. To increase sales, the sales manager would like to cut the selling price by \$20 per speaker and increase the advertising budget by \$15,000 per month. The sales manager believes that if these two steps are taken, unit sales will increase by 50% to 600 speakers per month. Should the changes be made?

A decrease in the selling price of \$20 per speaker would decrease the unit contribution margin by \$20 down to \$80.

Solution

Expected total contribution margin with lower selling price:	
600 speakers × \$80 per speaker	\$48,000
Present total contribution margin:	
400 speakers × \$100 per speaker	<u>40,000</u>
Incremental contribution margin	8,000
Change in fixed expenses:	
Less incremental advertising expense	<u>15,000</u>
Reduction in net operating income	<u><u>\$ (7,000)</u></u>

According to this analysis, the changes should not be made. The \$7,000 reduction in net operating income that is shown above can be verified by preparing comparative income statements as follows:

	Present 400 Speakers per Month		Expected 600 Speakers per Month		Difference
	Total	Per Unit	Total	Per Unit	
Sales.....	\$100,000	\$250	\$138,000	\$230	\$38,000
Variable expenses.....	<u>60,000</u>	<u>150</u>	<u>90,000</u>	<u>150</u>	<u>30,000</u>
Contribution margin.....	40,000	<u>\$100</u>	48,000	<u>\$ 80</u>	8,000
Fixed expenses	<u>35,000</u>		<u>50,000*</u>		<u>15,000</u>
Net operating income (loss)...	<u>\$ 5,000</u>		<u>\$ (2,000)</u>		<u>\$ (7,000)</u>

*35,000 + Additional monthly advertising budget of \$15,000 = \$50,000.

IN BUSINESS

Delta Attempts to Boost Ticket Sales

The United States Transportation Department ranked the Cincinnati/Northern Kentucky International Airport (CNK) as the second most expensive airport in the country. Because of its high ticket prices, CNK airport officials estimated that they were losing 28% of Cincinnati-area travelers—about 2,500 people per day—to five surrounding airports that offered lower fares. **Delta Airlines**, which has 90% of the traffic at CNK, attempted to improve the situation by introducing SimpliFares. The program, which Delta touted with a \$2 million media campaign, not only lowered fares but also reduced the ticket change fee from \$100 to \$50. From a cost-volume-profit standpoint, Delta was hoping that the increase in discretionary fixed advertising costs and the decrease in sales revenue realized from lower ticket prices would be more than offset by an increase in sales volume.

Source: James Pilcher, "New Delta Fares Boost Ticket Sales," *The Cincinnati Enquirer*, September 3, 2004, pp. A1 and A12.

Change in Variable Cost, Fixed Cost, and Sales Volume Refer to Acoustic Concepts' original data. As before, the company is currently selling 400 speakers per month. The sales manager would like to pay salespersons a sales commission of \$15 per speaker sold, rather than the flat salaries that now total \$6,000 per month. The sales manager is confident that the change would increase monthly sales by 15% to 460 speakers per month. Should the change be made?

Solution Changing the sales staff's compensation from salaries to commissions would affect both fixed and variable expenses. Fixed expenses would decrease by \$6,000, from \$35,000 to \$29,000. Variable expenses per unit would increase by \$15, from \$150 to \$165, and the unit contribution margin would decrease from \$100 to \$85.

Expected total contribution margin with sales staff on commissions:	
460 speakers × \$85 per speaker	\$39,100
Present total contribution margin:	
400 speakers × \$100 per speaker	40,000
Decrease in total contribution margin	(900)
Change in fixed expenses:	
Add salaries avoided if a commission is paid	6,000
Increase in net operating income	<u>\$ 5,100</u>

According to this analysis, the changes should be made. Again, the same answer can be obtained by preparing comparative income statements:

	Present 400 Speakers per Month		Expected 460 Speakers per Month		Difference
	Total	Per Unit	Total	Per Unit	
Sales	\$100,000	\$250	\$115,000	\$250	\$15,000
Variable expenses	<u>60,000</u>	<u>150</u>	<u>75,900</u>	<u>165</u>	<u>15,900</u>
Contribution margin.....	40,000	<u>\$100</u>	39,100	<u>\$ 85</u>	900
Fixed expenses.....	<u>35,000</u>		<u>29,000</u>		<u>(6,000)*</u>
Net operating income.....	<u>\$ 5,000</u>		<u>\$ 10,100</u>		<u>\$ 5,100</u>

*Note: A *reduction* in fixed expenses has the effect of *increasing* net operating income.

Change in Selling Price Refer to the original data where Acoustic Concepts is currently selling 400 speakers per month. The company has an opportunity to make a bulk sale of 150 speakers to a wholesaler if an acceptable price can be negotiated. This sale would not disturb the company's regular sales and would not affect the company's total fixed expenses. What price per speaker should be quoted to the wholesaler if Acoustic Concepts wants to increase its total monthly profits by \$3,000?

Solution

Variable cost per speaker	\$150
Desired profit per speaker:	
\$3,000 ÷ 150 speakers	20
Quoted price per speaker	<u>\$170</u>

Notice that fixed expenses are not included in the computation. This is because fixed expenses are not affected by the bulk sale, so all of the additional contribution margin increases the company's profits.

TARGET PROFIT AND BREAK-EVEN ANALYSIS

Target profit analysis and break-even analysis are used to answer questions such as how much would we have to sell to make a profit of \$10,000 per month or how much would we have to sell to avoid incurring a loss?

Target Profit Analysis

One of the key uses of CVP analysis is called *target profit analysis*. In **target profit analysis**, we estimate what sales volume is needed to achieve a specific target profit. For example, suppose that Prem Narayan of Acoustic Concepts would like to know what sales would have to be to attain a target profit of \$40,000 per month. To answer this question, we can proceed using the equation method or the formula method.

The Equation Method We can use a basic profit equation to find the sales volume required to attain a target profit. In the case of Acoustic Concepts, the company has only one product so we can use the contribution margin form of the equation. Remembering that the target profit is \$40,000, the unit contribution margin is \$100, and the fixed expense is \$35,000, we can solve as follows:

$$\begin{aligned}\text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expense} \\ \$40,000 &= \$100 \times Q - \$35,000 \\ \$100 \times Q &= \$40,000 + \$35,000 \\ Q &= (\$40,000 + \$35,000) \div \$100 \\ Q &= 750\end{aligned}$$

Thus, the target profit can be achieved by selling 750 speakers per month.

The Formula Method The formula method is a short-cut version of the equation method. Note that in the next to the last line of the above solution, the sum of the target profit of \$40,000 and the fixed expense of \$35,000 is divided by the unit contribution margin of \$100. In general, in a single-product situation, we can

LEARNING OBJECTIVE 5

Determine the level of sales needed to achieve a desired target profit.



compute the sales volume required to attain a specific target profit using the following formula:

$$\text{Unit sales to attain the target profit} = \frac{\text{Target profit} + \text{Fixed expenses}^*}{\text{Unit CM}}$$

*This equation can be derived as follows:

$$\begin{aligned}\text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expenses} \\ \text{Target profit} &= \text{Unit CM} \times Q - \text{Fixed expenses} \\ \text{Unit CM} \times Q &= \text{Target profit} + \text{Fixed expenses} \\ Q &= (\text{Target profit} + \text{Fixed expenses}) \div \text{Unit CM}\end{aligned}$$

In the case of Acoustic Concepts, the formula yields the following answer:

$$\begin{aligned}\text{Unit sales to attain the target profit} &= \frac{\text{Target profit} + \text{Fixed expenses}}{\text{Unit CM}} \\ &= \frac{\$40,000 + \$35,000}{\$100} \\ &= 750\end{aligned}$$

Note that this is the same answer we got when we used the equation method—and it always will be. The formula method simply skips a few steps in the equation method.

Target Profit Analysis in Terms of Sales Dollars Instead of unit sales, we may want to know what dollar sales are needed to attain the target profit. We can get this answer using several methods. First, we could solve for the unit sales to attain the target profit using the equation method or the formula method and then multiply the result by the selling price. In the case of Acoustic Concepts, the required sales volume using this approach would be computed as 750 speakers \times \$250 per speaker or \$187,500 in total sales.

We can also solve for the required sales volume to attain the target profit of \$40,000 at Acoustic Concepts using the basic equation stated in terms of the contribution margin ratio:

$$\begin{aligned}\text{Profit} &= \text{CM ratio} \times \text{Sales} - \text{Fixed expenses} \\ \$40,000 &= 0.40 \times \text{Sales} - \$35,000 \\ 0.40 \times \text{Sales} &= \$40,000 + \$35,000 \\ \text{Sales} &= (\$40,000 + \$35,000) \div 0.40 \\ \text{Sales} &= \$187,500\end{aligned}$$

Note that in the next to the last line of the above solution, the sum of the target profit of \$40,000 and the fixed expense of \$35,000 is divided by the contribution margin ratio of 0.40. In general, we can compute dollar sales to attain a target profit as follows:

$$\text{Dollar sales to attain a target profit} = \frac{\text{Target profit} + \text{Fixed expenses}^*}{\text{CM ratio}}$$

*This equation can be derived as follows:

$$\begin{aligned}\text{Profit} &= \text{CM ratio} \times \text{Sales} - \text{Fixed expenses} \\ \text{Target profit} &= \text{CM ratio} \times \text{Sales} - \text{Fixed expenses} \\ \text{CM ratio} \times \text{Sales} &= \text{Target profit} + \text{Fixed expenses} \\ \text{Sales} &= (\text{Target profit} + \text{Fixed expenses}) \div \text{CM ratio}\end{aligned}$$

At Acoustic Concepts, the formula yields the following answer:

$$\begin{aligned} \text{Dollar sales to attain a target profit} &= \frac{\text{Target profit} + \text{Fixed expenses}}{\text{CM ratio}} \\ &= \frac{\$40,000 + \$35,000}{0.40} \\ &= \$187,500 \end{aligned}$$

Again, you get exactly the same answer whether you use the equation method or just use the formula.

In companies with multiple products, sales volume is more conveniently expressed in terms of total sales dollars than in terms of unit sales. The contribution margin ratio approach to target profit analysis is particularly useful for such companies.

Break-Even Analysis

Earlier in the chapter we defined the break-even point as the level of sales at which the company's profit is zero. What we call *break-even analysis* is really just a special case of target profit analysis in which the target profit is zero. We can use either the equation method or the formula method to solve for the break-even point, but for brevity we will illustrate just the formula method. The equation method works exactly like it did in target profit analysis. The only difference is that the target profit is zero in break-even analysis.

Break-Even in Unit Sales In a single product situation, recall that the formula for the unit sales to attain a specific target profit is:

$$\text{Unit sales to attain the target profit} = \frac{\text{Target profit} + \text{Fixed expenses}}{\text{Unit CM}}$$

To compute the unit sales to break even, all we have to do is to set the target profit to zero in the above equation as follows:

$$\text{Unit sales to break even} = \frac{\$0 + \text{Fixed expenses}}{\text{Unit CM}}$$

$$\text{Unit sales to break even} = \frac{\text{Fixed expenses}}{\text{Unit CM}}$$

In the case of Acoustic Concepts, the break-even point can be computed as follows:

$$\begin{aligned} \text{Unit sales to break even} &= \frac{\text{Fixed expenses}}{\text{Unit CM}} \\ &= \frac{\$35,000}{\$100} \\ &= 350 \end{aligned}$$

Thus, as we determined earlier in the chapter, Acoustic Concepts breaks even at sales of 350 speakers per month.

LEARNING OBJECTIVE 6

Determine the break-even point.



2. Assume the selling price per unit is \$30, the contribution margin ratio is 40%, and the total fixed cost is \$60,000. What is the break-even point in unit sales?
 - a. 2,000
 - b. 3,000
 - c. 4,000
 - d. 5,000



**CONCEPT
CHECK**

IN BUSINESS

Costs on the Internet



The company **eToys**, which sells toys over the Internet, lost \$190 million in 1999 on sales of \$151 million. One big cost was advertising. eToys spent about \$37 on advertising for each \$100 of sales. (Other e-tailers were spending even more—in some cases, up to \$460 on advertising for each \$100 in sales!)

eToys did have some advantages relative to bricks-and-mortar stores such as **Toys “R” Us**. eToys had much lower inventory costs because it only needed to keep on hand one or two of a slow-moving item, whereas a traditional store has to fully stock its shelves. And bricks-and-mortar retail spaces in malls and elsewhere do cost money—on average, about 7% of sales. However, e-tailers such as eToys have their own set of disadvantages. Customers “pick and pack” their own items at a bricks-and-mortar outlet, but e-tailers have to pay employees to carry out this task. This costs eToys about \$33 for every \$100 in sales. And the technology to sell over the Internet is not free. eToys spent about \$29 on its website and related technology for every \$100 in sales. However, many of these costs of selling over the Internet are fixed. Toby Lenk, the CEO of eToys, estimated that the company would pass its break-even point somewhere between \$750 and \$900 million in sales—representing less than 1% of the market for toys. eToys did not make this goal and laid off 70% of its employees in January 2001. Subsequently, eToys was acquired by KBToys.com.

Sources: Erin Kelly, “The Last e-Store on the Block,” *Fortune*, September 18, 2000, pp. 214–220; Jennifer Couzin, *The Industry Standard*, January 4, 2001.

Break-Even in Sales Dollars We can find the break-even point in sales dollars using several methods. First, we could solve for the break-even point in unit sales using the equation method or the formula method and then multiply the result by the selling price. In the case of Acoustic Concepts, the break-even point in sales dollars using this approach would be computed as 350 speakers \times \$250 per speaker or \$87,500 in total sales.

We can also solve for the break-even point in sales dollars at Acoustic Concepts using the basic profit equation stated in terms of the contribution margin ratio or we can use the formula for the target profit. Again, for brevity, we will use the formula.

$$\text{Dollar sales to attain a target profit} = \frac{\text{Target profit} + \text{Fixed expenses}}{\text{CM ratio}}$$

$$\text{Dollar sales to break even} = \frac{\$0 + \text{Fixed expenses}}{\text{CM ratio}}$$

$$\text{Dollar sales to break even} = \frac{\text{Fixed expenses}}{\text{CM ratio}}$$

The break-even point at Acoustic Concepts would be computed as follows:

$$\begin{aligned} \text{Dollar sales to break even} &= \frac{\text{Fixed expenses}}{\text{CM ratio}} \\ &= \frac{\$35,000}{0.40} \\ &= \$87,500 \end{aligned}$$

Recruit

YOU DECIDE

Assume that you are being recruited by the ConneXus Corp. and have an interview scheduled later this week. You are interested in working for this company for a variety of reasons. In preparation for the interview, you did some research at your local library and gathered the following information about the company. ConneXus is a company set up by two young engineers, George Searle and Humphrey Chen, to allow consumers to order music CDs on their cell phones. Suppose you hear on the radio a cut from a CD that you would like to own. If you subscribe to their service, you would pick up your cell phone, punch “*CD,” and enter the radio station’s frequency and the time you heard the song, and the CD would be on its way to you.



ConneXus charges about \$17 for a CD, including shipping. The company pays its supplier about \$13 for the CD, leaving a contribution margin of \$4 per CD. Because of the fixed costs of running the service (about \$1,850,000 a year), Searle expects the company to lose about \$1.5 million in its first year of operations on sales of 88,000 CDs.

What are your initial impressions of this company based on the information you gathered? What other information would you want to obtain during the job interview?

Source: Adapted from Peter Kafka, “Play It Again,” *Forbes*, July 26, 1999, p. 94.

Cost Overruns Increase the Break-Even Point

IN BUSINESS

When **Airbus** launched the A380 555-seat jetliner in 2000 the company said it would need to sell 250 units to break even on the project. By 2006, Airbus was admitting that more than \$3 billion of cost overruns had raised the project’s break-even point to 420 airplanes. Although Airbus has less than 170 orders for the A380, the company remains optimistic that it will sell 751 units over the next 20 years. Given that Airbus rival **Boeing** predicts the total market size for all airplanes with more than 400 seats will not exceed 990 units, it remains unclear if Airbus will ever break even on its investment in the A380 aircraft.



Source: Daniel Michaels, “Embattled Airbus Lifts Sales Target for A380 to Profit,” *The Wall Street Journal*, October 20, 2006, p. A6.

The Margin of Safety

The **margin of safety** is the excess of budgeted (or actual) sales dollars over the break-even volume of sales dollars. It is the amount by which sales can drop before losses are incurred. The higher the margin of safety, the lower the risk of not breaking even and incurring a loss. The formula for the margin of safety is:

$$\text{Margin of safety in dollars} = \text{Total budgeted (or actual) sales} - \text{Break-even sales}$$

The margin of safety can also be expressed in percentage form by dividing the margin of safety in dollars by total dollar sales:

$$\text{Margin of safety percentage} = \frac{\text{Margin of safety in dollars}}{\text{Total budgeted (or actual) sales in dollars}}$$

LEARNING OBJECTIVE 7

Compute the margin of safety and explain its significance.



The calculation of the margin of safety for Acoustic Concepts is:

Sales (at the current volume of 400 speakers) (a)	\$100,000
Break-even sales (at 350 speakers).....	87,500
Margin of safety in dollars (b)	\$ 12,500
Margin of safety percentage, (b) ÷ (a)	12.5%

This margin of safety means that at the current level of sales and with the company's current prices and cost structure, a reduction in sales of \$12,500, or 12.5%, would result in just breaking even.

In a single-product company like Acoustic Concepts, the margin of safety can also be expressed in terms of the number of units sold by dividing the margin of safety in dollars by the selling price per unit. In this case, the margin of safety is 50 speakers ($\$12,500 \div \250 per speaker = 50 speakers).

IN BUSINESS

Computing Margin of Safety for a Small Business

Sam Calagione owns **Dogfish Head Craft Brewery**, a microbrewery in Rehobeth Beach, Delaware. He charges distributors as much as \$100 per case for his premium beers such as World Wide Stout. The high-priced microbrews bring in \$800,000 in operating income on revenue of \$7 million. Calagione reports that his raw ingredients and labor costs for one case of World Wide Stout are \$30 and \$16, respectively. Bottling and packaging costs are \$6 per case. Gas and electric costs are about \$10 per case.

If we assume that World Wide Stout is representative of all Dogfish microbrews, then we can compute the company's margin of safety in five steps. First, variable cost as a percentage of sales is 62% [$(\$30 + \$16 + \$6 + \$10)/\$100$]. Second, the contribution margin ratio is 38% ($1 - 0.62$). Third, Dogfish's total fixed cost is \$1,860,000 [$(\$7,000,000 \times 0.38) - \$800,000$]. Fourth, the break-even point in sales dollars is \$4,894,737 ($\$1,860,000/0.38$). Fifth, the margin of safety is \$2,105,263 ($\$7,000,000 - \$4,894,737$).

Source: Patricia Huang, "Château Dogfish," *Forbes*, February 28, 2005, pp. 57–59.

MANAGERIAL ACCOUNTING IN ACTION

The Wrap-up



Prem Narayan and Bob Luchinni met to discuss the results of Bob's analysis.

Prem: Bob, everything you have shown me is pretty clear. I can see what impact some of the sales manager's suggestions would have on our profits. Some of those suggestions are quite good and others are not so good. I am concerned that our margin of safety is only 50 speakers. What can we do to increase this number?

Bob: Well, we have to increase total sales or decrease the break-even point or both.

Prem: And to decrease the break-even point, we have to either decrease our fixed expenses or increase our unit contribution margin?

Bob: Exactly.

Prem: And to increase our unit contribution margin, we must either increase our selling price or decrease the variable cost per unit?

Bob: Correct.

Prem: So what do you suggest?

Bob: Well, the analysis doesn't tell us which of these to do, but it does indicate we have a potential problem here.

Prem: If you don't have any immediate suggestions, I would like to call a general meeting next week to discuss ways we can work on increasing the margin of safety. I think everyone will be concerned about how vulnerable we are to even small downturns in sales.

Loan Officer

DECISION MAKER

Steve Becker owns **Blue Ridge Brewery**, a microbrewery in Arden, North Carolina. He charges distributors \$100 per case for his premium beer. The distributors tack on 25% when selling to retailers who in turn add a 30% markup before selling the beer to consumers. In the most recent year, Blue Ridge's revenue was \$8 million and its net operating income was \$700,000. Becker reports that the costs of making one case of his premium beer are \$32 for raw ingredients, \$20 for labor, \$4 for bottling and packaging, and \$12 for utilities.

Assume that Becker has approached your bank for a loan. As the loan officer you should consider a variety of factors, including the company's margin of safety. Assuming that other information about the company is favorable, would you consider Blue Ridge's margin of safety to be comfortable enough to extend a loan?

3. Assume a company produces one product that sells for \$55, has a variable cost per unit of \$35, and has fixed costs of \$100,000. How many units must the company sell to earn a target profit of \$50,000?
 - a. 7,500 units
 - b. 10,000 units
 - c. 12,500 units
 - d. 15,000 units
4. Given the same facts as in question 3 above, if the company exactly meets its target profit, what will be its margin of safety in sales dollars?
 - a. \$110,000
 - b. \$127,500
 - c. \$137,500
 - d. \$150,000



CVP CONSIDERATIONS IN CHOOSING A COST STRUCTURE

Cost structure refers to the relative proportion of fixed and variable costs in an organization. Managers often have some latitude in trading off between these two types of costs. For example, fixed investments in automated equipment can reduce variable labor costs. In this section, we discuss the choice of a cost structure. We also introduce the concept of *operating leverage*.

Cost Structure and Profit Stability

Which cost structure is better—high variable costs and low fixed costs, or the opposite? No single answer to this question is possible; each approach has its advantages. To show what we mean, refer to the contribution format income statements given below for two

blueberry farms. Bogside Farm depends on migrant workers to pick its berries by hand, whereas Sterling Farm has invested in expensive berry-picking machines. Consequently, Bogside Farm has higher variable costs, but Sterling Farm has higher fixed costs:

	Bogside Farm		Sterling Farm	
	Amount	Percent	Amount	Percent
Sales	\$100,000	100%	\$100,000	100%
Variable expenses	60,000	60%	30,000	30%
Contribution margin	40,000	40%	70,000	70%
Fixed expenses	30,000		60,000	
Net operating income.....	\$ 10,000		\$ 10,000	

Which farm has the better cost structure? The answer depends on many factors, including the long-run trend in sales, year-to-year fluctuations in the level of sales, and the attitude of the owners toward risk. If sales are expected to exceed \$100,000 in the future, then Sterling Farm probably has the better cost structure. The reason is that its CM ratio is higher, and its profits will therefore increase more rapidly as sales increase. To illustrate, assume that each farm experiences a 10% increase in sales without any increase in fixed costs. The new income statements would be as follows:

	Bogside Farm		Sterling Farm	
	Amount	Percent	Amount	Percent
Sales	\$110,000	100%	\$110,000	100%
Variable expenses	66,000	60%	33,000	30%
Contribution margin	44,000	40%	77,000	70%
Fixed expenses	30,000		60,000	
Net operating income.....	\$ 14,000		\$ 17,000	

Sterling Farm has experienced a greater increase in net operating income due to its higher CM ratio even though the increase in sales was the same for both farms.

What if sales drop below \$100,000? What are the farms' break-even points? What are their margins of safety? The computations needed to answer these questions are shown below using the contribution margin method:

	Bogside Farm	Sterling Farm
Fixed expenses	\$ 30,000	\$ 60,000
Contribution margin ratio	÷ 0.40	÷ 0.70
Dollar sales to break even	\$ 75,000	\$ 85,714
Total current sales (a)	\$100,000	\$100,000
Break-even sales	75,000	85,714
Margin of safety in sales dollars (b)	\$ 25,000	\$ 14,286
Margin of safety percentage (b) ÷ (a)	25.0%	14.3%

Bogside Farm's margin of safety is greater and its contribution margin ratio is lower than Sterling Farm. Therefore, Bogside Farm is less vulnerable to downturns than Sterling Farm. Due to its lower contribution margin ratio, Bogside Farm will not lose contribution margin as rapidly as Sterling Farm when sales decline. Thus, Bogside Farm's profit will

be less volatile. We saw earlier that this is a drawback when sales increase, but it provides more protection when sales drop. And because its break-even point is lower, Bogside Farm can suffer a larger sales decline before losses emerge.

To summarize, without knowing the future, it is not obvious which cost structure is better. Both have advantages and disadvantages. Sterling Farm, with its higher fixed costs and lower variable costs, will experience wider swings in net operating income as sales fluctuate, with greater profits in good years and greater losses in bad years. Bogside Farm, with its lower fixed costs and higher variable costs, will enjoy greater profit stability and will be more protected from losses during bad years, but at the cost of lower net operating income in good years.

A Losing Cost Structure

IN BUSINESS

Both **JetBlue** and **United Airlines** use an Airbus 235 to fly from Dulles International Airport near Washington, DC, to Oakland, California. Both planes have a pilot, copilot, and four flight attendants. That is where the similarity ends. Based on 2002 data, the pilot on the United flight earned \$16,350 to \$18,000 a month compared to \$6,800 per month for the JetBlue pilot. United's senior flight attendants on the plane earned more than \$41,000 per year; whereas the JetBlue attendants were paid \$16,800 to \$27,000 per year. Largely because of the higher labor costs at United, its costs of operating the flight were more than 60% higher than JetBlue's costs. Due to intense fare competition from JetBlue and other low-cost carriers, United was unable to cover its higher operating costs on this and many other flights. Consequently, United went into bankruptcy at the end of 2002.

Source: Susan Carey, "Costly Race in the Sky," *The Wall Street Journal*, September 9, 2002, pp. B1 and B3.

Operating Leverage

A lever is a tool for multiplying force. Using a lever, a massive object can be moved with only a modest amount of force. In business, *operating leverage* serves a similar purpose. **Operating leverage** is a measure of how sensitive net operating income is to a given percentage change in dollar sales. Operating leverage acts as a multiplier. If operating leverage is high, a small percentage increase in sales can produce a much larger percentage increase in net operating income.

Operating leverage can be illustrated by returning to the data for the two blueberry farms. We previously showed that a 10% increase in sales (from \$100,000 to \$110,000 in each farm) results in a 70% increase in the net operating income of Sterling Farm (from \$10,000 to \$17,000) and only a 40% increase in the net operating income of Bogside Farm (from \$10,000 to \$14,000). Thus, for a 10% increase in sales, Sterling Farm experiences a much greater percentage increase in profits than does Bogside Farm. Therefore, Sterling Farm has greater operating leverage than Bogside Farm.

The **degree of operating leverage** at a given level of sales is computed by the following formula:

$$\text{Degree of operating leverage} = \frac{\text{Contribution margin}}{\text{Net operating income}}$$

The degree of operating leverage is a measure, at a given level of sales, of how a percentage change in sales volume will affect profits. To illustrate, the degree of operating leverage for the two farms at \$100,000 sales would be computed as follows:

$$\begin{aligned} \text{Bogside Farm: } & \frac{\$40,000}{\$10,000} = 4 \\ \text{Sterling Farm: } & \frac{\$70,000}{\$10,000} = 7 \end{aligned}$$

LEARNING OBJECTIVE 8

Compute the degree of operating leverage at a particular level of sales and explain how it can be used to predict changes in net operating income.



Because the degree of operating leverage for Bogside Farm is 4, the farm's net operating income grows four times as fast as its sales. In contrast, Sterling Farm's net operating income grows seven times as fast as its sales. Thus, if sales increase by 10%, then we can expect the net operating income of Bogside Farm to increase by four times this amount, or by 40%, and the net operating income of Sterling Farm to increase by seven times this amount, or by 70%.

	Percent Increase in Sales (1)	Degree of Operating Leverage (2)	Percent Increase in Net Operating Income (1) × (2)
Bogside Farm	10%	4	40%
Sterling Farm	10%	7	70%

What is responsible for the higher operating leverage at Sterling Farm? The only difference between the two farms is their cost structure. If two companies have the same total revenue and same total expense but different cost structures, then the company with the higher proportion of fixed costs in its cost structure will have higher operating leverage. Referring back to the original example on page 278, when both farms have sales of \$100,000 and total expenses of \$90,000, one-third of Bogside Farm's costs are fixed but two-thirds of Sterling Farm's costs are fixed. As a consequence, Sterling's degree of operating leverage is higher than Bogside's.

The degree of operating leverage is not a constant; it is greatest at sales levels near the break-even point and decreases as sales and profits rise. The following table shows the degree of operating leverage for Bogside Farm at various sales levels. (Data used earlier for Bogside Farm are shown in color.)

Sales	\$75,000	\$80,000	\$100,000	\$150,000	\$225,000
Variable expenses	45,000	48,000	60,000	90,000	135,000
Contribution margin (a)	30,000	32,000	40,000	60,000	90,000
Fixed expenses	30,000	30,000	30,000	30,000	30,000
Net operating income (b)	\$ 0	\$ 2,000	\$ 10,000	\$ 30,000	\$ 60,000
Degree of operating leverage, (a) ÷ (b).....	∞	16	4	2	1.5

Thus, a 10% increase in sales would increase profits by only 15% ($10\% \times 1.5$) if sales were previously \$225,000, as compared to the 40% increase we computed earlier at the \$100,000 sales level. The degree of operating leverage will continue to decrease the farther the company moves from its break-even point. At the break-even point, the degree of operating leverage is infinitely large ($\$30,000$ contribution margin ÷ $\$0$ net operating income = ∞).

IN BUSINESS

Operating Leverage: A Key to Profitable E-Commerce

Did you ever wonder why **Expedia** and **eBay** were among the first Internet companies to become profitable? One big reason is because they sell information products rather than physical products. For example, when somebody buys a physical product, such as a book from **Amazon.com**, the company needs to purchase a copy of the book from the publisher, process it, and ship it; hence, Amazon.com's gross margins are around 26%. However, once Expedia covers its fixed overhead

IN BUSINESS

(continued)

costs, the extra expense incurred to provide service to one more customer is practically zero; therefore, the incremental revenue provided by that customer “falls to the bottom line.”

In the first quarter of 2002, Expedia doubled its sales to \$116 million and reported net income of \$5.7 million compared to a loss of \$17.6 million in the first quarter of 2001. This is the beauty of having a high degree of operating leverage. Sales growth can quickly translate to profit growth when variable costs are negligible. Of course, operating leverage has a dark side—if Expedia’s sales plummet, its profits will nosedive as well.

Source: Timothy J. Mullaney and Robert D. Hof, “Finally, the Pot of Gold,” *BusinessWeek*, June 24, 2002, pp. 104–106.

The degree of operating leverage can be used to quickly estimate what impact various percentage changes in sales will have on profits, without the necessity of preparing detailed income statements. As shown by our examples, the effects of operating leverage can be dramatic. If a company is near its break-even point, then even small percentage increases in sales can yield large percentage increases in profits. *This explains why management will often* leverage is 5, then a 6% increase in sales would translate into a 30% increase in profits.

STRUCTURING SALES COMMISSIONS

Companies usually compensate salespeople by paying them a commission based on sales, a salary, or a combination of the two. Commissions based on sales dollars can lead to lower profits. To illustrate, consider Pipeline Unlimited, a producer of surfing equipment. Salespersons sell the company’s products to retail sporting goods stores throughout North America and the Pacific Basin. Data for two of the company’s surfboards, the XR7 and Turbo models, appear below:

	Model	
	XR7	Turbo
Selling price	\$695	\$749
Variable expenses	344	410
Contribution margin	<u>\$351</u>	<u>\$339</u>

Which model will salespeople push hardest if they are paid a commission of 10% of sales revenue? The answer is the Turbo because it has the higher selling price and hence the larger commission. On the other hand, from the standpoint of the company, profits will be greater if salespeople steer customers toward the XR7 model because it has the higher contribution margin.

To eliminate such conflicts, commissions can be based on contribution margin rather than on selling price. If this is done, the salespersons will want to sell the mix of products that maximizes contribution margin. Providing that fixed costs are not affected by the sales mix, maximizing the contribution margin will also maximize the company’s profit.¹ In effect, by maximizing their own compensation, salespersons will also maximize the company’s profit.

¹This also assumes the company has no production constraint. If it does, the sales commissions should be modified.

IN BUSINESS

An Alternative Approach to Sales Commissions

Thrive Networks, located in Concord, Massachusetts, used to pay its three salesmen based on individually earned commissions. This system seemed to be working fine as indicated by the company's sales growth from \$2.7 million in 2002 to \$3.6 million in 2003. However, the company felt there was a better way to motivate and compensate its salesmen. It pooled commissions across the three salesmen and compensated them collectively. The new approach was designed to build teamwork and leverage each salesman's individual strengths. Jim Lippie, the director of business development, was highly skilled at networking and generating sales leads. John Barrows, the sales director, excelled at meeting with prospective clients and producing compelling proposals. Nate Wolfson, the CEO and final member of the sales team, was the master at closing the deal. The new approach has worked so well that Wolfson plans to use three-person sales teams in his offices nationwide.

Source: Cara Cannella, "Kill the Commissions," *Inc.* magazine, August 2004, p. 38.

SALES MIX

LEARNING OBJECTIVE 9

Compute the break-even point for a multiproduct company and explain the effects of shifts in the sales mix on contribution margin and the break-even point.



Before concluding our discussion of CVP concepts, we need to consider the impact of changes in *sales mix* on a company's profit.

The Definition of Sales Mix

The term **sales mix** refers to the relative proportions in which a company's products are sold. The idea is to achieve the combination, or **mix**, that will yield the greatest amount of profits. Most companies have many products, and often these products are not equally profitable. Hence, profits will depend to some extent on the company's sales mix. Profits will be greater if high-margin rather than low-margin items make up a relatively large proportion of total sales.

Changes in the sales mix can cause perplexing variations in a company's profits. A shift in the sales mix from high-margin items to low-margin items can cause total profits to decrease even though total sales may increase. Conversely, a shift in the sales mix from low-margin items to high-margin items can cause the reverse effect—total profits may increase even though total sales decrease. It is one thing to achieve a particular sales volume; it is quite another to sell the most profitable mix of products.

IN BUSINESS

Wal-Mart Attempts to Shift Its Sales Mix

Almost 130 million customers shop at **Wal-Mart's** 3,200 U.S. stores each week. However, less than half of them shop the whole store—choosing to buy only low-margin basics while skipping higher-margin departments such as apparel. In an effort to shift its sales mix toward higher-margin merchandise, Wal-Mart has reduced spending on advertising and plowed the money into remodeling the clothing departments within its stores. The company hopes this remodeling effort will entice its customers to add clothing to their shopping lists while bypassing the apparel offerings of competitors such as **Kohl's** and **Target**.

Source: Robert Berner, "Fashion Emergency at Wal-Mart," *BusinessWeek*, July 31, 2006, p. 67.



Sales Mix and Break-Even Analysis

If a company sells more than one product, break-even analysis is more complex than discussed to this point. The reason is that different products will have different selling prices, different costs, and different contribution margins. Consequently, the break-even point depends on the mix in which the various products are sold. To illustrate, consider Virtual Journeys Unlimited, a small company that imports DVDs from France. At present, the company sells two DVDs: the Le Louvre DVD, a tour of the famous art museum in Paris; and the Le Vin DVD, which features the wines and wine-growing regions of France. The company's September sales, expenses, and break-even point are shown in Exhibit 6-4.

As shown in the exhibit, the break-even point is \$60,000 in sales, which was computed by dividing the company's fixed expenses of \$27,000 by its overall CM ratio of 45%. However, this is the break-even only if the company's sales mix does not change. Currently, the Le Louvre DVD is responsible for 20% and the Le Vin DVD for 80% of the company's dollar sales. Assuming this sales mix does not change, if total sales are \$60,000, the sales of the Le Louvre DVD would be \$12,000 (20% of \$60,000) and the sales of the Le Vin DVD would be \$48,000 (80% of \$60,000). As shown in Exhibit 6-4, at these levels of sales, the company would indeed break even. But \$60,000 in sales represents the break-even point for the company only if the sales mix does not change. *If the sales mix changes, then the break-even point will also usually change.* This is illustrated

EXHIBIT 6-4 Multiproduct Break-Even Analysis

Virtual Journeys Unlimited Contribution Income Statement For the Month of September						
	Le Louvre DVD		Le Vin DVD		Total	
	Amount	Percent	Amount	Percent	Amount	Percent
Sales.....	\$20,000	100%	\$80,000	100%	\$100,000	100%
Variable expenses.....	15,000	75%	40,000	50%	55,000	55%
Contribution margin.....	<u>\$ 5,000</u>	<u>25%</u>	<u>\$40,000</u>	<u>50%</u>	<u>45,000</u>	<u>45%</u>
Fixed expenses.....					27,000	
Net operating income.....					<u>\$ 18,000</u>	
Computation of the break-even point:						
	$\frac{\text{Fixed expenses}}{\text{Overall CM ratio}} = \frac{\$27,000}{0.45} = \$60,000$					
Verification of the break-even point						
	Le Louvre DVD	Le Vin DVD	Total			
Current dollar sales.....	\$20,000	\$80,000	\$100,000			
Percentage of total dollar sales.....	20%	80%	100%			
Sales at the break-even point.....	\$12,000	\$48,000	\$60,000			
	Le Louvre DVD		Le Vin DVD		Total	
	Amount	Percent	Amount	Percent	Amount	Percent
Sales.....	\$12,000	100%	\$48,000	100%	\$ 60,000	100%
Variable expenses.....	9,000	75%	24,000	50%	33,000	55%
Contribution margin.....	<u>\$ 3,000</u>	<u>25%</u>	<u>\$24,000</u>	<u>50%</u>	<u>27,000</u>	<u>45%</u>
Fixed expenses.....					27,000	
Net operating income.....					<u>\$ 0</u>	

EXHIBIT 6-5 Multiproduct Break-Even Analysis: A Shift in Sales Mix (see Exhibit 6-4)

Virtual Journeys Unlimited Contribution Income Statement For the Month of October						
	Le Louvre DVD		Le Vin DVD		Total	
	Amount	Percent	Amount	Percent	Amount	Percent
Sales.....	\$80,000	100%	\$20,000	100%	\$100,000	100%
Variable expenses.....	60,000	75%	10,000	50%	70,000	70%
Contribution margin.....	<u>\$20,000</u>	<u>25%</u>	<u>\$10,000</u>	<u>50%</u>	30,000	<u>30%</u>
Fixed expenses.....					27,000	
Net operating income.....					<u>\$ 3,000</u>	
Computation of the break-even point:						
	$\frac{\text{Fixed expenses}}{\text{Overall CM ratio}} = \frac{\$27,000}{0.30} = \$90,000$					

by the results for October in which the sales mix shifted away from the more profitable Le Vin DVD (which has a 50% CM ratio) toward the less profitable Le Louvre CD (which has a 25% CM ratio). These results appear in Exhibit 6-5.

Although sales have remained unchanged at \$100,000, the sales mix is exactly the reverse of what it was in Exhibit 6-4, with the bulk of the sales now coming from the less profitable Le Louvre DVD. Notice that this shift in the sales mix has caused both the overall CM ratio and total profits to drop sharply from the prior month even though total sales are the same. The overall CM ratio has dropped from 45% in September to only 30% in October, and net operating income has dropped from \$18,000 to only \$3,000. In addition, with the drop in the overall CM ratio, the company’s break-even point is no longer \$60,000 in sales. Because the company is now realizing less average contribution margin per dollar of sales, it takes more sales to cover the same amount of fixed costs. Thus, the break-even point has increased from \$60,000 to \$90,000 in sales per year.

In preparing a break-even analysis, an assumption must be made concerning the sales mix. Usually the assumption is that it will not change. However, if the sales mix is expected to change, then this must be explicitly considered in any CVP computations.

ASSUMPTIONS OF CVP ANALYSIS

A number of assumptions commonly underlie CVP analysis:

1. Selling price is constant. The price of a product or service will not change as volume changes.
2. Costs are linear and can be accurately divided into variable and fixed elements. The variable element is constant per unit, and the fixed element is constant in total over the entire relevant range.
3. In multiproduct companies, the sales mix is constant.
4. In manufacturing companies, inventories do not change. The number of units produced equals the number of units sold.

While these assumptions may be violated in practice, the results of CVP analysis are often “good enough” to be quite useful. Perhaps the greatest danger lies in relying on simple CVP analysis when a manager is contemplating a large change in volume that

lies outside of the relevant range. For example, a manager might contemplate increasing the level of sales far beyond what the company has ever experienced before. However, even in these situations the model can be adjusted as we have done in this chapter to take into account anticipated changes in selling prices, fixed costs, and the sales mix that would otherwise violate the assumptions mentioned above. For example, in a decision that would affect fixed costs, the change in fixed costs can be explicitly taken into account as illustrated earlier in the chapter in the Acoustic Concepts example on pages 267–271.

Playing the CVP Game

IN BUSINESS

In 2002, **General Motors (GM)** gave away almost \$2,600 per vehicle in customer incentives such as price cuts and 0% financing. “The pricing sacrifices have been more than offset by volume gains, most of which have come from trucks and SUVs, like the Chevy Suburban and the GMC Envoy, which generate far more profit for the company than cars. **Lehman Brothers** analysts estimate that GM will sell an additional 395,000 trucks and SUVs and an extra 75,000 cars in 2002. The trucks, however, are the company’s golden goose, hauling in an average [contribution margin] . . . of about \$7,000, compared with just \$4,000 for the cars. All told, the volume gains could bring in an additional \$3 billion [in profits].”

Source: Janice Revell, “GM’s Slow Leak,” *Fortune*, October 28, 2002, pp. 105–110.

SUMMARY

LO1 Explain how changes in activity affect contribution margin and net operating income.

The unit contribution margin, which is the difference between a unit’s selling price and its variable cost, indicates how net operating income will change as the result of selling one more or one less unit. For example, if a product’s unit contribution margin is \$10, then selling one more unit will add \$10 to the company’s profit.

LO2 Prepare and interpret a cost-volume-profit (CVP) graph and a profit graph.

A cost-volume-profit graph displays sales revenues and expenses as a function of unit sales. The break-even point on the graph is the point at which the total sales revenue and total expense lines intersect. A profit graph displays profit as a function of unit sales. The break-even point on the profit graph is the point at which profit is zero.

LO3 Use the contribution margin ratio (CM ratio) to compute changes in contribution margin and net operating income resulting from changes in sales volume.

The contribution margin ratio is computed by dividing the unit contribution margin by the unit selling price, or by dividing the total contribution margin by the total sales.

The contribution margin shows how much a dollar increase in sales affects the total contribution margin and net operating income. For example, if a product has a 40% contribution margin ratio, then a \$100 increase in sales should result in a \$40 increase in contribution margin and in net operating income.

LO4 Show the effects on contribution margin of changes in variable costs, fixed costs, selling price, and volume.

Contribution margin concepts can be used to estimate the effects of changes in various parameters such as variable costs, fixed costs, selling prices, and volume on the total contribution margin and net operating income.

LO5 Determine the level of sales needed to achieve a desired target profit.

The level of sales needed to achieve a desired target profit can be computed using several methods. The answer can be derived using the fundamental profit equation and simple algebra or formulas can be used. In either approach, the unit sales required to attain a desired target profit is ultimately determined by summing the desired target profit and the fixed expenses and then dividing the result by the unit contribution margin.

LO6 Determine the break-even point.

The break-even point is the level of sales at which profit is zero. This is just a special case of solving for the level of sales needed to achieve a desired target profit—in this special case the target profit is zero.

LO7 Compute the margin of safety and explain its significance.

The margin of safety is the difference between the total budgeted (or actual) sales dollars of a period and the break-even sales dollars. It expresses how much cushion there is in the current level of sales above the break-even point.

LO8 Compute the degree of operating leverage at a particular level of sales and explain how it can be used to predict changes in net operating income.

The degree of operating leverage is computed by dividing the total contribution margin by net operating income. The degree of operating leverage can be used to determine the impact a given percentage change in sales would have on net operating income. For example, if a company's degree of operating leverage is 2.5, then a 10% increase in sales from the current level of sales should result in a 25% increase in net operating income.

LO9 Compute the break-even point for a multiproduct company and explain the effects of shifts in the sales mix on contribution margin and the break-even point.

The break-even point for a multiproduct company can be computed by dividing the company's total fixed expenses by the overall contribution margin ratio.

This method for computing the break-even point assumes that the sales mix is constant. If the sales mix shifts toward products with a lower contribution margin ratio, then more total sales are required to attain any given level of profits.

GUIDANCE ANSWERS TO DECISION MAKER AND YOU DECIDE

Recruit (p. 275)

You can get a feel for the challenges that this company will face by determining its break-even point.

$$\text{Sales} = \text{Variable expenses} + \text{Fixed expenses} + \text{Profits}$$

$$\$17Q = \$13Q + \$1,850,000 + \$0$$

$$\$4Q = \$1,850,000$$

$$Q = 462,500$$

Assuming that its cost structure stays the same, ConneXus needs to increase its sales by 426%—from 88,000 to 462,500 CDs—just to break even. After it reaches that break-even point, net operating income will increase by \$4 (the contribution margin) for each additional CD that it sells. Joining the company would be a risky proposition; you should be prepared with some probing questions when you arrive for your interview. (For example, what steps does the company plan to take to increase sales? How might the company reduce its fixed and/or variable expenses so as to lower its break-even point?)

Loan Officer (p. 277)

To determine the company's margin of safety, you need to determine its break-even point. Start by estimating the company's variable expense ratio:

$$\text{Variable cost per unit} \div \text{Selling price per unit} = \text{Variable expense ratio}$$

$$\$68 \div \$100 = 68\%$$

Then, estimate the company's variable expenses:

$$\begin{aligned} \text{Sales} \times \text{Variable expense ratio} &= \text{Estimated amount of variable expenses} \\ \$8,000,000 \times 0.68 &= \$5,440,000 \end{aligned}$$

Next, estimate the company's current level of fixed expenses as follows:

$$\begin{aligned} \text{Sales} &= \text{Variable expenses} + \text{Fixed expenses} + \text{Profits} \\ \$8,000,000 &= \$5,440,000 + X + \$7 \\ X &= \$8,000,000 - \$5,440,000 - \$7 \\ X &= \$1,860,000 \end{aligned}$$

Use the equation approach to estimate the company's break-even point:

$$\begin{aligned} \text{Sales} &= \text{Variable expenses} + \text{Fixed expenses} + \text{Profits} \\ X &= 0.68X + \$1,860,000 + \$0 \\ 0.32X &= \$1,860,000 \\ X &= \$5,812,500 \end{aligned}$$

Finally, compute the company's margin of safety:

$$\begin{aligned} \text{Margin of safety} &= (\text{Sales} - \text{Break-even sales}) \div \text{Sales} \\ &= (\$8,000,000 - \$5,812,500) \div \$8,000,000 \\ &= 27.3\% \end{aligned}$$

The margin of safety appears to be adequate, so if the other information about the company is favorable, a loan would seem to be justified.

GUIDANCE ANSWERS TO CONCEPT CHECKS



1. **Choice d.** The contribution margin ratio equals $1.0 - \text{Variable costs as a percent of sales}$.
2. **Choice d.** The contribution margin per unit is \$12 (40% of \$30). Therefore, the break-even point in units sold = $\$60,000 \div \$12 = 5,000$.
3. **Choice a.** $(\$100,000 + \$50,000) \div \$20$ contribution margin per unit = 7,500 units.
4. **Choice c.** 7,500 units is 2,500 units above the break-even point. Therefore, the margin of safety is $2,500 \text{ units} \times \$55 \text{ per unit} = \$137,500$.

REVIEW PROBLEM: CVP RELATIONSHIPS

Voltar Company manufactures and sells a specialized cordless telephone for high electromagnetic radiation environments. The company's contribution format income statement for the most recent year is given below:

	Total	Per Unit	Percent of Sales
Sales (20,000 units).....	\$1,200,000	\$60	100%
Variable expenses.....	<u>900,000</u>	<u>45</u>	<u>? %</u>
Contribution margin.....	300,000	<u>\$15</u>	<u>? %</u>
Fixed expenses.....	<u>240,000</u>		
Net operating income.....	<u>\$ 60,000</u>		

Management is anxious to increase the company's profit and has asked for an analysis of a number of items.

Required:

1. Compute the company's CM ratio and variable expense ratio.
2. Compute the company's break-even point in both units and sales dollars. Use the equation method.
3. Assume that sales increase by \$400,000 next year. If cost behavior patterns remain unchanged, by how much will the company's net operating income increase? Use the CM ratio to compute your answer.
4. Refer to the original data. Assume that next year management wants the company to earn a profit of at least \$90,000. How many units will have to be sold to meet this target profit?
5. Refer to the original data. Compute the company's margin of safety in both dollar and percentage form.
6.
 - a. Compute the company's degree of operating leverage at the present level of sales.
 - b. Assume that through a more intense effort by the sales staff, the company's sales increase by 8% next year. By what percentage would you expect net operating income to increase? Use the degree of operating leverage to obtain your answer.
 - c. Verify your answer to (b) by preparing a new contribution format income statement showing an 8% increase in sales.
7. In an effort to increase sales and profits, management is considering the use of a higher-quality speaker. The higher-quality speaker would increase variable costs by \$3 per unit, but management could eliminate one quality inspector who is paid a salary of \$30,000 per year. The sales manager estimates that the higher-quality speaker would increase annual sales by at least 20%.
 - a. Assuming that changes are made as described above, prepare a projected contribution format income statement for next year. Show data on a total, per unit, and percentage basis.
 - b. Compute the company's new break-even point in both units and dollars of sales. Use the formula method.
 - c. Would you recommend that the changes be made?

Solution to Review Problem

1.

$$\text{CM ratio} = \frac{\text{Unit contribution margin}}{\text{Unit selling price}} = \frac{\$15}{\$60} = 25\%$$

$$\text{Variable expense ratio} = \frac{\text{Variable expense}}{\text{Selling price}} = \frac{\$45}{\$60} = 75\%$$

2.

$$\begin{aligned} \text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expenses} \\ \$0 &= (\$60 - \$45) \times Q - \$240,000 \\ \$15Q &= \$240,000 \\ Q &= \$240,000 \div \$15 \\ Q &= 16,000 \text{ units; or at } \$60 \text{ per unit, } \$960,000 \end{aligned}$$

3.

Increase in sales.....	\$400,000
Multiply by the CM ratio.....	× 25%
Expected increase in contribution margin.....	<u>\$100,000</u>

Because the fixed expenses are not expected to change, net operating income will increase by the entire \$100,000 increase in contribution margin computed above.

4. Equation method:

$$\begin{aligned} \text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expenses} \\ \$90,000 &= (\$60 - \$45) \times Q - \$240,000 \\ \$15Q &= \$90,000 + \$240,000 \\ Q &= \$330,000 \div \$15 \\ Q &= 22,000 \text{ units} \end{aligned}$$

Formula method:

$$\text{Unit sales to attain the target profit} = \frac{\text{Target profit} + \text{Fixed expenses}}{\text{Contribution margin per unit}} = \frac{\$90,000 + \$240,000}{\$15 \text{ per unit}} = 22,000 \text{ units}$$

5. $\text{Margin of safety in dollars} = \text{Total sales} - \text{Break-even sales}$
 $= \$1,200,000 - \$960,000 = \$240,000$

$$\text{Margin of safety percentage} = \frac{\text{Margin of safety in dollars}}{\text{Total sales}} = \frac{\$240,000}{\$1,200,000} = 20\%$$

6. a. $\text{Degree of operating leverage} = \frac{\text{Contribution margin}}{\text{Net operating income}} = \frac{\$300,000}{\$60,000} = 5$

b.

Expected increase in sales	8%
Degree of operating leverage	× 5
Expected increase in net operating income.....	<u>40%</u>

c. If sales increase by 8%, then 21,600 units (20,000 × 1.08 = 21,600) will be sold next year. The new contribution format income statement would be as follows:

	Total	Per Unit	Percent of Sales
Sales (21,600 units).....	\$1,296,000	\$60	100%
Variable expenses	972,000	45	75%
Contribution margin	324,000	<u>\$15</u>	<u>25%</u>
Fixed expenses	240,000		
Net operating income	<u>\$ 84,000</u>		

Thus, the \$84,000 expected net operating income for next year represents a 40% increase over the \$60,000 net operating income earned during the current year:

$$\frac{\$84,000 - \$60,000}{\$60,000} = \frac{\$24,000}{\$60,000} = 40\% \text{ increase}$$

Note from the income statement above that the increase in sales from 20,000 to 21,600 units has increased *both* total sales and total variable expenses.

7. a. A 20% increase in sales would result in 24,000 units being sold next year: 20,000 units × 1.20 = 24,000 units.

	Total	Per Unit	Percent of Sales
Sales (24,000 units).....	\$1,440,000	\$60	100%
Variable expenses	1,152,000	48*	80%
Contribution margin	288,000	<u>\$12</u>	<u>20%</u>
Fixed expenses	210,000 [†]		
Net operating income	<u>\$ 78,000</u>		

*\$45 + \$3 = \$48; \$48 ÷ \$60 = 80%.

[†]\$240,000 - \$30,000 = \$210,000.

Note that the change in per unit variable expenses results in a change in both the per unit contribution margin and the CM ratio.

$$\begin{aligned} \text{b. Unit sales to break even} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ &= \frac{\$210,000}{\$12 \text{ per unit}} = 17,500 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Dollar sales to break even} &= \frac{\text{Fixed expenses}}{\text{CM ratio}} \\ &= \frac{\$210,000}{0.20} = \$1,050,000 \end{aligned}$$

- c. Yes, based on these data the changes should be made. The changes increase the company's net operating income from the present \$60,000 to \$78,000 per year. Although the changes also result in a higher break-even point (17,500 units as compared to the present 16,000 units), the company's margin of safety actually becomes greater than before:

$$\begin{aligned} \text{Margin of safety in dollars} &= \text{Total sales} - \text{Break-even sales} \\ &= \$1,440,000 - \$1,050,000 = \$390,000 \end{aligned}$$

As shown in (5) on the prior page, the company's present margin of safety is only \$240,000. Thus, several benefits will result from the proposed changes.

GLOSSARY

- Break-even point** The level of sales at which profit is zero. (p. 260)
- Contribution margin ratio (CM ratio)** A ratio computed by dividing contribution margin by dollar sales. (p. 265)
- Cost-volume-profit (CVP) graph** A graphical representation of the relationships between an organization's revenues, costs, and profits on the one hand and its sales volume on the other hand. (p. 262)
- Degree of operating leverage** A measure, at a given level of sales, of how a percentage change in sales will affect profits. The degree of operating leverage is computed by dividing contribution margin by net operating income. (p. 279)
- Incremental analysis** An analytical approach that focuses only on those costs and revenues that change as a result of a decision. (p. 268)
- Margin of safety** The excess of budgeted (or actual) dollar sales over the break-even dollar sales. (p. 275)
- Operating leverage** A measure of how sensitive net operating income is to a given percentage change in dollar sales. (p. 279)
- Sales mix** The relative proportions in which a company's products are sold. Sales mix is computed by expressing the sales of each product as a percentage of total sales. (p. 282)
- Target profit analysis** Estimating what sales volume is needed to achieve a specific target profit. (p. 271)
- Variable expense ratio** A ratio computed by dividing variable expenses by dollar sales. (p. 267)

QUESTIONS

- 6-1 What is meant by a product's contribution margin ratio? How is this ratio useful in planning business operations?
- 6-2 Often the most direct route to a business decision is an incremental analysis. What is meant by an *incremental analysis*?
- 6-3 In all respects, Company A and Company B are identical except that Company A's costs are mostly variable, whereas Company B's costs are mostly fixed. When sales increase, which company will tend to realize the greatest increase in profits? Explain.
- 6-4 What is meant by the term *operating leverage*?
- 6-5 What is meant by the term *break-even point*?

- 6-6 In response to a request from your immediate supervisor, you have prepared a CVP graph portraying the cost and revenue characteristics of your company's product and operations. Explain how the lines on the graph and the break-even point would change if (a) the selling price per unit decreased, (b) fixed cost increased throughout the entire range of activity portrayed on the graph, and (c) variable cost per unit increased.
- 6-7 What is meant by the margin of safety?
- 6-8 What is meant by the term *sales mix*? What assumption is usually made concerning sales mix in CVP analysis?
- 6-9 Explain how a shift in the sales mix could result in both a higher break-even point and a lower net income.

Multiple-choice questions are provided on the text website at www.mhhe.com/brewer5e.



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BRIEF EXERCISES

BRIEF EXERCISE 6-1 Preparing a Contribution Format Income Statement [LO1]

Whirly Corporation's most recent income statement is shown below:

	Total	Per Unit
Sales (10,000 units).....	\$350,000	\$35.00
Variable expenses.....	<u>200,000</u>	<u>20.00</u>
Contribution margin.....	150,000	<u>\$15.00</u>
Fixed expenses.....	<u>135,000</u>	
Net operating income.....	<u>\$ 15,000</u>	

Required:

Prepare a new contribution format income statement under each of the following conditions (consider each case independently):

1. The sales volume increases by 100 units.
2. The sales volume decreases by 100 units.
3. The sales volume is 9,000 units.

BRIEF EXERCISE 6-2 Prepare a Cost-Volume-Profit (CVP) Graph [LO2]

Karlik Enterprises distributes a single product whose selling price is \$24 and whose variable expense is \$18 per unit. The company's monthly fixed expense is \$24,000.



Required:

1. Prepare a cost-volume-profit graph for the company up to a sales level of 8,000 units.
2. Estimate the company's break-even point in unit sales using your cost-volume-profit graph.

BRIEF EXERCISE 6-3 Prepare a Profit Graph [LO2]

Jaffre Enterprises distributes a single product whose selling price is \$16 and whose variable expense is \$11 per unit. The company's fixed expense is \$16,000 per month.



Required:

1. Prepare a profit graph for the company up to a sales level of 4,000 units.
2. Estimate the company's break-even point in unit sales using your profit graph.

BRIEF EXERCISE 6-4 Computing and Using the CM Ratio [LO3]

Last month when Holiday Creations, Inc., sold 50,000 units, total sales were \$200,000, total variable expenses were \$120,000, and fixed expenses were \$65,000.



Required:

1. What is the company's contribution margin (CM) ratio?
2. Estimate the change in the company's net operating income if it were to increase its total sales by \$1,000.

BRIEF EXERCISE 6-5 Changes in Variable Costs, Fixed Costs, Selling Price, and Volume [LO4]

Data for Hermann Corporation are shown below:

	Per Unit	Percent of Sales
Selling price.....	\$90	100%
Variable expenses.....	<u>63</u>	<u>70</u>
Contribution margin.....	<u>\$27</u>	<u>30%</u>

Fixed expenses are \$30,000 per month and the company is selling 2,000 units per month.

Required:

- The marketing manager argues that a \$5,000 increase in the monthly advertising budget would increase monthly sales by \$9,000. Should the advertising budget be increased?
- Refer to the original data. Management is considering using higher-quality components that would increase the variable cost by \$2 per unit. The marketing manager believes the higher-quality product would increase sales by 10% per month. Should the higher-quality components be used?

BRIEF EXERCISE 6-6 Compute the Level of Sales Required to Attain a Target Profit [LO5]

Lin Corporation has a single product whose selling price is \$120 and whose variable expense is \$80 per unit. The company's monthly fixed expense is \$50,000.

Required:

- Using the equation method, solve for the unit sales that are required to earn a target profit of \$10,000.
- Using the formula method, solve for the unit sales that are required to earn a target profit of \$15,000.

**BRIEF EXERCISE 6-7 Compute the Break-Even Point [LO6]**

Mauro Products distributes a single product, a woven basket whose selling price is \$15 and whose variable expense is \$12 per unit. The company's monthly fixed expense is \$4,200.

Required:

- Solve for the company's break-even point in unit sales using the equation method.
- Solve for the company's break-even point in sales dollars using the equation method and the CM ratio.
- Solve for the company's break-even point in unit sales using the formula method.
- Solve for the company's break-even point in sales dollars using the formula method and the CM ratio.

**BRIEF EXERCISE 6-8 Compute the Margin of Safety [LO7]**

Molander Corporation is a distributor of a sun umbrella used at resort hotels. Data concerning the next month's budget appear below:

Selling price.....	\$30 per unit
Variable expenses.....	\$20 per unit
Fixed expenses.....	\$7,500 per month
Unit sales.....	1,000 units per month

Required:

- Compute the company's margin of safety.
- Compute the company's margin of safety as a percentage of its sales.

**BRIEF EXERCISE 6-9 Compute and Use the Degree of Operating Leverage [LO8]**

Engberg Company installs lawn sod in home yards. The company's most recent monthly contribution format income statement follows:

	Amount	Percent of Sales
Sales.....	\$80,000	100%
Variable expenses	<u>32,000</u>	<u>40%</u>
Contribution margin	48,000	<u>60%</u>
Fixed expenses	<u>38,000</u>	
Net operating income	<u>\$10,000</u>	

Required:

1. Compute the company's degree of operating leverage.
2. Using the degree of operating leverage, estimate the impact on net operating income of a 5% increase in sales.
3. Verify your estimate from part (2) above by constructing a new contribution format income statement for the company assuming a 5% increase in sales.

BRIEF EXERCISE 6-10 Compute the Break-Even Point for a Multiproduct Company [LO9]

Lucido Products markets two computer games: Claimjumper and Makeover. A contribution format income statement for a recent month for the two games appears below:



	Claimjumper	Makeover	Total
Sales.....	\$30,000	\$70,000	\$100,000
Variable expenses	<u>20,000</u>	<u>50,000</u>	<u>70,000</u>
Contribution margin	<u>\$10,000</u>	<u>\$20,000</u>	30,000
Fixed expenses			<u>24,000</u>
Net operating income			<u>\$ 6,000</u>

Required:

1. Compute the overall contribution margin (CM) ratio for the company.
2. Compute the overall break-even point for the company in sales dollars.
3. Verify the overall break-even point for the company by constructing a contribution format income statement showing the appropriate levels of sales for the two products.

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EXERCISES

EXERCISE 6-11 Using a Contribution Format Income Statement [LO1, LO4]

Miller Company's most recent contribution format income statement is shown below:

	Total	Per Unit
Sales (20,000 units).....	\$300,000	\$15.00
Variable expenses	<u>180,000</u>	<u>9.00</u>
Contribution margin	120,000	<u>\$ 6.00</u>
Fixed expenses	<u>70,000</u>	
Net operating income	<u>\$ 50,000</u>	

Required:

Prepare a new contribution format income statement under each of the following conditions (consider each case independently):

1. The number of units sold increases by 15%.
2. The selling price decreases by \$1.50 per unit, and the number of units sold increases by 25%.

- The selling price increases by \$1.50 per unit, fixed expenses increase by \$20,000, and the number of units sold decreases by 5%.
- The selling price increases by 12%, variable expenses increase by 60 cents per unit, and the number of units sold decreases by 10%.



EXERCISE 6-12 Target Profit and Break-Even Analysis; Margin of Safety; CM Ratio [LO1, LO3, LO5, LO6, LO7]

Menlo Company distributes a single product. The company's sales and expenses for last month follow:

	Total	Per Unit
Sales.....	\$450,000	\$30
Variable expenses.....	180,000	12
Contribution margin.....	270,000	\$18
Fixed expenses.....	216,000	
Net operating income.....	\$ 54,000	

Required:

- What is the monthly break-even point in units sold and in sales dollars?
- Without resorting to computations, what is the total contribution margin at the break-even point?
- How many units would have to be sold each month to earn a target profit of \$90,000? Use the formula method. Verify your answer by preparing a contribution format income statement at the target sales level.
- Refer to the original data. Compute the company's margin of safety in both dollar and percentage terms.
- What is the company's CM ratio? If sales increase by \$50,000 per month and there is no change in fixed expenses, by how much would you expect monthly net operating income to increase?



EXERCISE 6-13 Target Profit and Break-Even Analysis [LO3, LO4, LO5, LO6]

Lindon Company is the exclusive distributor for an automotive product that sells for \$40 per unit and has a CM ratio of 30%. The company's fixed expenses are \$180,000 per year. The company plans to sell 16,000 units this year.

Required:

- What are the variable expenses per unit?
- Using the equation method:
 - What is the break-even point in units and sales dollars?
 - What sales level in units and in sales dollars is required to earn an annual profit of \$60,000?
 - Assume that by using a more efficient shipper, the company is able to reduce its variable expenses by \$4 per unit. What is the company's new break-even point in units and sales dollars?
- Repeat (2) above using the formula method.

EXERCISE 6-14 Missing Data; Basic CVP Concepts [LO1, LO9]

Fill in the missing amounts in each of the eight case situations below. Each case is independent of the others. (*Hint:* One way to find the missing amounts would be to prepare a contribution format income statement for each case, enter the known data, and then compute the missing items.)

- Assume that only one product is being sold in each of the four following case situations:

Case	Units Sold	Sales	Variable Expenses	Contribution Margin per Unit	Fixed Expenses	Net Operating Income (Loss)
1	15,000	\$180,000	\$120,000	?	\$50,000	?
2	?	\$100,000	?	\$10	\$32,000	\$8,000
3	10,000	?	\$70,000	\$13	?	\$12,000
4	6,000	\$300,000	?	?	\$100,000	\$(10,000)

b. Assume that more than one product is being sold in each of the four following case situations:

Case	Sales	Variable Expenses	Average Contribution Margin Ratio	Fixed Expenses	Net Operating Income (Loss)
1	\$500,000	?	20%	?	\$7,000
2	\$400,000	\$260,000	?	\$100,000	?
3	?	?	60%	\$130,000	\$20,000
4	\$600,000	\$420,000	?	?	\$(5,000)

EXERCISE 6-15 Operating Leverage [LO4, LO8]

Magic Realm, Inc., has developed a new fantasy board game. The company sold 15,000 games last year at a selling price of \$20 per game. Fixed costs associated with the game total \$182,000 per year, and variable costs are \$6 per game. Production of the game is entrusted to a printing contractor. Variable costs consist mostly of payments to this contractor.



Required:

- Prepare a contribution format income statement for the game last year and compute the degree of operating leverage.
- Management is confident that the company can sell 18,000 games next year (an increase of 3,000 games, or 20%, over last year). Compute:
 - The expected percentage increase in net operating income for next year.
 - The expected total dollar net operating income for next year. (Do not prepare an income statement; use the degree of operating leverage to compute your answer.)

EXERCISE 6-16 Target Profit and Break-Even Analysis [LO4, LO5, LO6]

Outback Outfitters sells recreational equipment. One of the company's products, a small camp stove, sells for \$50 per unit. Variable expenses are \$32 per stove, and fixed expenses associated with the stove total \$108,000 per month.



Required:

- Compute the break-even point in number of stoves and in total sales dollars.
- If the variable expenses per stove increase as a percentage of the selling price, will it result in a higher or a lower break-even point? Why? (Assume that the fixed expenses remain unchanged.)
- At present, the company is selling 8,000 stoves per month. The sales manager is convinced that a 10% reduction in the selling price would result in a 25% increase in monthly sales of stoves. Prepare two contribution format income statements, one under present operating conditions, and one as operations would appear after the proposed changes. Show both total and per unit data on your statements.
- Refer to the data in (3) above. How many stoves would have to be sold at the new selling price to yield a minimum net operating income of \$35,000 per month?

EXERCISE 6-17 Break-Even Analysis and CVP Graphing [LO2, LO4, LO6]

The Hartford Symphony Guild is planning its annual dinner-dance. The dinner-dance committee has assembled the following expected costs for the event:



Dinner (per person)	\$18
Favors and program (per person).....	\$2
Band	\$2,800
Rental of ballroom	\$900
Professional entertainment during intermission.....	\$1,000
Tickets and advertising.....	\$1,300

The committee members would like to charge \$35 per person for the evening's activities.

Required:

1. Compute the break-even point for the dinner-dance (in terms of the number of persons who must attend).
2. Assume that last year only 300 persons attended the dinner-dance. If the same number attend this year, what price per ticket must be charged in order to break even?
3. Refer to the original data (\$35 ticket price per person). Prepare a CVP graph for the dinner-dance from zero tickets up to 600 tickets sold.



EXERCISE 6-18 Multiproduct Break-Even Analysis [LO9]

Olongapo Sports Corporation is the distributor in the Philippines of two premium golf balls—the Flight Dynamic and the Sure Shot. Monthly sales, expressed in pesos (P), and the contribution margin ratios for the two products follow:

	Product		Total
	Flight Dynamic	Sure Shot	
Sales.....	P150,000	P250,000	P400,000
CM ratio.....	80%	36%	?

Fixed expenses total P183,750 per month.

Required:

1. Prepare a contribution format income statement for the company as a whole. Carry computations to one decimal place.
2. Compute the break-even point for the company based on the current sales mix.
3. If sales increase by P100,000 a month, by how much would you expect net operating income to increase? What are your assumptions?

PROBLEMS



Alternate problem set is available on the text website.

CHECK FIGURE

(2) Break-even: \$300,000

PROBLEM 6-19A Basics of CVP Analysis [LO1, LO3, LO4, LO6, LO8]

Feather Friends, Inc., distributes a high-quality wooden birdhouse that sells for \$20 per unit. Variable costs are \$8 per unit, and fixed costs total \$180,000 per year.



Required:

Answer the following independent questions:

1. What is the product's CM ratio?
2. Use the CM ratio to determine the break-even point in sales dollars.
3. Due to an increase in demand, the company estimates that sales will increase by \$75,000 during the next year. By how much should net operating income increase (or net loss decrease) assuming that fixed costs do not change?
4. Assume that the operating results for last year were:

Sales.....	\$400,000
Variable expenses.....	160,000
Contribution margin.....	240,000
Fixed expenses.....	180,000
Net operating income.....	<u>\$ 60,000</u>

- a. Compute the degree of operating leverage at the current level of sales.
 - b. The president expects sales to increase by 20% next year. By what percentage should net operating income increase?
5. Refer to the original data. Assume that the company sold 18,000 units last year. The sales manager is convinced that a 10% reduction in the selling price, combined with a \$30,000 increase in advertising, would cause annual sales in units to increase by one-third. Prepare two contribution format income statements, one showing the results of last year's operations and one showing the results of operations if these changes are made. Would you recommend that the company do as the sales manager suggests?
 6. Refer to the original data. Assume again that the company sold 18,000 units last year. The president does not want to change the selling price. Instead, he wants to increase the sales commission by \$1 per unit. He thinks that this move, combined with some increase in advertising, would increase annual sales by 25%. By how much could advertising be increased with profits remaining unchanged? Do not prepare an income statement; use the incremental analysis approach.

PROBLEM 6-20A Sales Mix; Multiproduct Break-Even Analysis [LO9]

Gold Star Rice, Ltd., of Thailand exports Thai rice throughout Asia. The company grows three varieties of rice—Fragrant, White, and Loonzain. (The currency in Thailand is the baht, which is denoted by B.) Budgeted sales by product and in total for the coming month are shown below:

CHECK FIGURE

(2) Break-even: B864,000

	Product						Total	
	White		Fragrant		Loonzain			
Percentage of total sales	20%		52%		28%		100%	
Sales.....	B150,000	100%	B390,000	100%	B210,000	100%	B750,000	100%
Variable expenses.....	108,000	72%	78,000	20%	84,000	40%	270,000	36%
Contribution margin.....	<u>B 42,000</u>	<u>28%</u>	<u>B312,000</u>	<u>80%</u>	<u>B126,000</u>	<u>60%</u>	<u>480,000</u>	<u>64%</u>
Fixed expenses.....							449,280	
Net operating income.....							<u>B30,720</u>	

$$\text{Dollar sales to break even} = \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\text{B}449,280}{0.64} = \text{B}702,000$$

As shown by these data, net operating income is budgeted at B30,720 for the month and break-even sales at B702,000.

Assume that actual sales for the month total B750,000 as planned. Actual sales by product are: White, B300,000; Fragrant, B180,000; and Loonzain, B270,000.



Required:

1. Prepare a contribution format income statement for the month based on actual sales data. Present the income statement in the format shown above.
2. Compute the break-even point in sales dollars for the month based on your actual data.
3. Considering the fact that the company met its B750,000 sales budget for the month, the president is shocked at the results shown on your income statement in (1) above. Prepare a brief memo for the president explaining why both the operating results and the break-even point in sales dollars are different from what was budgeted.

PROBLEM 6-21A Basic CVP Analysis; Graphing [LO1, LO2, LO4, LO6]

The Fashion Shoe Company operates a chain of women's shoe shops around the country. The shops carry many styles of shoes that are all sold at the same price. Sales personnel in the shops are paid a substantial commission on each pair of shoes sold (in addition to a small basic salary) in order to encourage them to be aggressive in their sales efforts.

CHECK FIGURE

- (1) Break-even: 12,500 pairs of shoes;
- (3) \$6,000 loss



The following worksheet contains cost and revenue data for Shop 48 and is typical of the company's many outlets:

	A	B	C
1		Per Pair of Shoes	
2	Selling price	\$ 30.00	
3			
4	Variable expenses:		
5	Invoice cost	\$ 13.50	
6	Sales commission	4.50	
7	Total variable expenses	\$ 18.00	
8			
9		Annual	
10	Fixed expenses:		
11	Advertising	\$ 30,000	
12	Rent	20,000	
13	Salaries	100,000	
14	Total fixed expenses	\$ 150,000	
15			

Required:

1. Calculate the annual break-even point in dollar sales and in unit sales for Shop 48.
2. Prepare a CVP graph showing cost and revenue data for Shop 48 from zero shoes up to 17,000 pairs of shoes sold each year. Clearly indicate the break-even point on the graph.
3. If 12,000 pairs of shoes are sold in a year, what would be Shop 48's net operating income or loss?
4. The company is considering paying the store manager of Shop 48 an incentive commission of 75 cents per pair of shoes (in addition to the salesperson's commission). If this change is made, what will be the new break-even point in dollar sales and in unit sales?
5. Refer to the original data. As an alternative to (4) above, the company is considering paying the store manager 50 cents commission on each pair of shoes sold in excess of the break-even point. If this change is made, what will be the shop's net operating income or loss if 15,000 pairs of shoes are sold?
6. Refer to the original data. The company is considering eliminating sales commissions entirely in its shops and increasing fixed salaries by \$31,500 annually. If this change is made, what will be the new break-even point in dollar sales and in unit sales for Shop 48? Would you recommend that the change be made? Explain.

CHECK FIGURE

- (3) Net loss: \$6,000;
 (5a) Break-even: 21,000 units

PROBLEM 6-22A Basics of CVP Analysis; Cost Structure [LO1, LO3, LO4, LO5, LO6]

Due to erratic sales of its sole product—a high-capacity battery for laptop computers—PEM, Inc., has been experiencing difficulty for some time. The company's contribution format income statement for the most recent month is given below:

Excel



Sales (19,500 units × \$30 per unit).....	\$585,000
Variable expenses.....	409,500
Contribution margin.....	175,500
Fixed expenses.....	180,000
Net operating loss.....	\$ (4,500)

Required:

1. Compute the company's CM ratio and its break-even point in both units and dollars.
2. The president believes that a \$16,000 increase in the monthly advertising budget, combined with an intensified effort by the sales staff, will result in an \$80,000 increase in monthly sales. If the president is right, what will be the effect on the company's monthly net operating income or loss? (Use the incremental approach in preparing your answer.)
3. Refer to the original data. The sales manager is convinced that a 10% reduction in the selling price, combined with an increase of \$60,000 in the monthly advertising budget, will cause unit sales to double. What will the new contribution format income statement look like if these changes are adopted?
4. Refer to the original data. The Marketing Department thinks that a fancy new package for the laptop computer battery would help sales. The new package would increase packaging costs by 75 cents per unit. Assuming no other changes, how many units would have to be sold each month to earn a profit of \$9,750?
5. Refer to the original data. By automating certain operations, the company could reduce variable costs by \$3 per unit. However, fixed costs would increase by \$72,000 each month.
 - a. Compute the new CM ratio and the new break-even point in both units and dollars.
 - b. Assume that the company expects to sell 26,000 units next month. Prepare two contribution format income statements, one assuming that operations are not automated and one assuming that they are. (Show data on a per unit and percentage basis, as well as in total, for each alternative.)
 - c. Would you recommend that the company automate its operations? Explain.

PROBLEM 6-23A Sales Mix; Break-Even Analysis; Margin of Safety [LO7, LO9]

Island Novelties, Inc., of Palau makes two products, Hawaiian Fantasy and Tahitian Joy. Present revenue, cost, and sales data for the two products follow:

CHECK FIGURE

(1b) Break-even: \$732,000;
(2b) Margin of safety percentage: 22%

	Hawaiian Fantasy	Tahitian Joy
Selling price per unit.....	\$15	\$100
Variable expenses per unit.....	\$9	\$20
Number of units sold annually	20,000	5,000



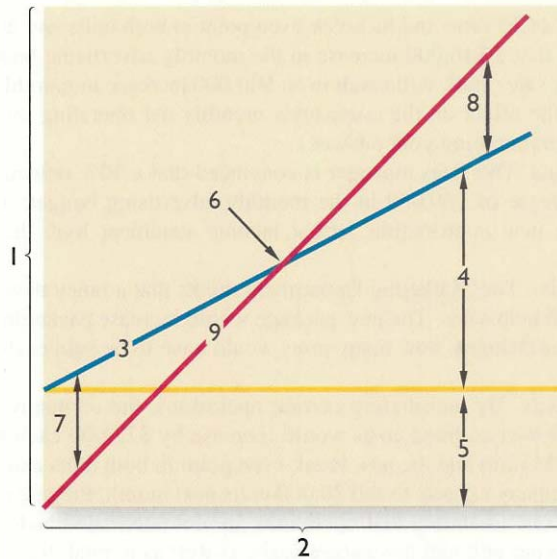
Fixed expenses total \$475,800 per year. The Republic of Palau uses the U.S. dollar as its currency.

Required:

1. Assuming the sales mix given above, do the following:
 - a. Prepare a contribution format income statement showing both dollar and percent columns for each product and for the company as a whole.
 - b. Compute the break-even point in dollars for the company as a whole and the margin of safety in both dollars and percent.
2. The company has developed a new product to be called Samoan Delight. Assume that the company could sell 10,000 units at \$45 each. The variable expenses would be \$36 each. The company's fixed expenses would not change.
 - a. Prepare another contribution format income statement, including sales of the Samoan Delight (sales of the other two products would not change).
 - b. Compute the company's new break-even point in dollars and the new margin of safety in both dollars and percent.
3. The president of the company examines your figures and says, "There's something strange here. Our fixed expenses haven't changed and you show greater total contribution margin if we add the new product, but you also show our break-even point going up. With greater contribution margin, the break-even point should go down, not up. You've made a mistake somewhere." Explain to the president what has happened.

PROBLEM 6-24A Interpretive Questions on the CVP Graph [LO2, LO6]

A CVP graph such as the one shown on the next page is a useful technique for showing relationships among an organization's costs, volume, and profits.

**Required:**

- Identify the numbered components in the CVP graph.
- State the effect of each of the following actions on line 3, line 9, and the break-even point. For line 3 and line 9, state whether the action will cause the line to:

- Remain unchanged.
- Shift upward.
- Shift downward.
- Have a steeper slope (i.e., rotate upward).
- Have a flatter slope (i.e., rotate downward).
- Shift upward *and* have a steeper slope.
- Shift upward *and* have a flatter slope.
- Shift downward *and* have a steeper slope.
- Shift downward *and* have a flatter slope.

In the case of the break-even point, state whether the action will cause the break-even point to:

- Remain unchanged.
 - Increase.
 - Decrease.
 - Probably change, but the direction is uncertain.
- Treat each case independently.

x. *Example.* Fixed costs are reduced by \$5,000 per period.

Answer (see choices above): Line 3: Shift downward.
 Line 9: Remain unchanged.
 Break-even point: Decrease.

- The unit selling price is increased from \$18 to \$20.
- Unit variable costs are decreased from \$12 to \$10.
- Fixed costs are increased by \$3,000 per period.
- Two thousand more units are sold during the period than were budgeted.
- Due to paying salespersons a commission rather than a flat salary, fixed costs are reduced by \$8,000 per period and unit variable costs are increased by \$3.
- Due to an increase in the cost of materials, both unit variable costs and the selling price are increased by \$2.
- Advertising costs are increased by \$10,000 per period, resulting in a 10% increase in the number of units sold.
- Due to automating an operation previously done by workers, fixed costs are increased by \$12,000 per period and unit variable costs are reduced by \$4.

CHECK FIGURE

- (1) Break-even: 2,500 pairs;
 (5a) Leverage: 6

PROBLEM 6-25A Graphing; Incremental Analysis; Operating Leverage [LO2, LO4, LO5, LO6, LO8]

Angie Silva has recently opened The Sandal Shop, a store that specializes in fashionable sandals in Brisbane, Australia. Angie has just received a degree in business and she is anxious to apply the principles

she has learned to her business. In time, she hopes to open a chain of sandal shops. As a first step, she has prepared the following analysis for her new store:



Sales price per pair of sandals	\$40
Variable expenses per pair of sandals	16
Contribution margin per pair of sandals	<u>\$24</u>
Fixed expenses per year:	
Building rental	\$15,000
Equipment depreciation	7,000
Selling	20,000
Administrative	<u>18,000</u>
Total fixed expenses	<u>\$60,000</u>

Required:

- How many pairs of sandals must be sold each year to break even? What does this represent in total sales dollars?
- Prepare a CVP graph or a profit graph for the store from zero pairs up to 4,000 pairs of sandals sold each year. Indicate the break-even point on your graph.
- Angie has decided that she must earn at least \$18,000 the first year to justify her time and effort. How many pairs of sandals must be sold to reach this target profit?
- Angie now has two salespersons working in the store—one full time and one part time. It will cost her an additional \$8,000 per year to convert the part-time position to a full-time position. Angie believes that the change would bring in an additional \$25,000 in sales each year. Should she convert the position? Use the incremental approach. (Do not prepare an income statement.)
- Refer to the original data. During the first year, the store sold only 3,000 pairs of sandals and reported the following operating results:

Sales (3,000 pairs)	\$120,000
Variable expenses	<u>48,000</u>
Contribution margin	72,000
Fixed expenses	<u>60,000</u>
Net operating income	<u>\$ 12,000</u>

- What is the store's degree of operating leverage?
- Angie is confident that with a more intense sales effort and with a more creative advertising program she can increase sales by 50% next year. What would be the expected percentage increase in net operating income? Use the degree of operating leverage to compute your answer.

PROBLEM 6-26A Target Profit and Break-Even Analysis [LO5, LO6]

The Shirt Works sells a large variety of tee shirts and sweatshirts. Steve Hooper, the owner, is thinking of expanding his sales by hiring local high school students, on a commission basis, to sell sweatshirts bearing the name and mascot of the local high school.

These sweatshirts would have to be ordered from the manufacturer six weeks in advance, and they could not be returned because of the unique printing required. The sweatshirts would cost Mr. Hooper \$8 each with a minimum order of 75 sweatshirts. Any additional sweatshirts would have to be ordered in increments of 75.

Since Mr. Hooper's plan would not require any additional facilities, the only costs associated with the project would be the costs of the sweatshirts and the costs of the sales commissions. The selling price of the sweatshirts would be \$13.50 each. Mr. Hooper would pay the students a commission of \$1.50 for each shirt sold.

Required:

- To make the project worthwhile, Mr. Hooper would require a \$1,200 profit for the first three months of the venture. What level of sales in units and in dollars would be required to reach this target net operating income? Show all computations.
- Assume that the venture is undertaken and an order is placed for 75 sweatshirts. What would be Mr. Hooper's break-even point in units and in sales dollars? Show computations and explain the reasoning behind your answer.

CHECK FIGURE

(1) Unit sales to attain target profit: 300 sweatshirts



CHECK FIGURE

(1) Break-even: 21,000 units

PROBLEM 6-27A Changes in Fixed and Variable Costs; Target Profit and Break-Even Analysis [LO4, LO5, LO6]

Neptune Company produces toys and other items for use in beach and resort areas. A small, inflatable toy has come onto the market that the company is anxious to produce and sell. The new toy will sell for \$3 per unit. Enough capacity exists in the company's plant to produce 16,000 units of the toy each month. Variable costs to manufacture and sell one unit would be \$1.25, and fixed costs associated with the toy would total \$35,000 per month.

The company's Marketing Department predicts that demand for the new toy will exceed the 16,000 units that the company is able to produce. Additional manufacturing space can be rented from another company at a fixed cost of \$1,000 per month. Variable costs in the rented facility would total \$1.40 per unit, due to somewhat less efficient operations than in the main plant.

Required:

1. Compute the monthly break-even point for the new toy in units and in total sales dollars. Show all computations.
2. How many units must be sold each month to make a monthly profit of \$12,000?
3. If the sales manager receives a bonus of 10 cents for each unit sold in excess of the break-even point, how many units must be sold each month to earn a return of 25% on the monthly investment in fixed costs?

BUILDING YOUR SKILLS

CHECK FIGURE

(2a) Velcro break-even: 50,000 units



ANALYTICAL THINKING [LO6, LO9]

Cheryl Montoya picked up the phone and called her boss, Wes Chan, the vice president of marketing at Piedmont Fasteners Corporation: "Wes, I'm not sure how to go about answering the questions that came up at the meeting with the president yesterday."

"What's the problem?"

"The president wanted to know the break-even point for each of the company's products, but I am having trouble figuring them out."

"I'm sure you can handle it, Cheryl. And, by the way, I need your analysis on my desk tomorrow morning at 8:00 sharp in time for the follow-up meeting at 9:00."

Piedmont Fasteners Corporation makes three different clothing fasteners in its manufacturing facility in North Carolina. Data concerning these products appear below:

	Velcro	Metal	Nylon
Normal annual sales volume	100,000	200,000	400,000
Unit selling price	\$1.65	\$1.50	\$0.85
Variable cost per unit.....	\$1.25	\$0.70	\$0.25

Total fixed expenses are \$400,000 per year.

All three products are sold in highly competitive markets, so the company is unable to raise its prices without losing unacceptable numbers of customers.

The company has an extremely effective lean production system, so there are no beginning or ending work in process or finished goods inventories.

Required:

1. What is the company's over-all break-even point in total sales dollars?
2. Of the total fixed costs of \$400,000, \$20,000 could be avoided if the Velcro product were dropped, \$80,000 if the Metal product were dropped, and \$60,000 if the Nylon product were dropped. The remaining fixed costs of \$240,000 consist of common fixed costs such as administrative salaries and rent on the factory building that could be avoided only by going out of business entirely.
 - a. What is the break-even point in units for each product?
 - b. If the company sells exactly the break-even quantity of each product, what will be the overall profit of the company? Explain this result.

COMMUNICATING IN PRACTICE [LO4, LO5, LO6]

Pittman Company is a small but growing manufacturer of telecommunications equipment. The company has no sales force of its own; rather, it relies completely on independent sales agents to market its products. These agents are paid a commission of 15% of selling price for all items sold.

Barbara Cheney, Pittman’s controller, has just prepared the company’s budgeted income statement for next year. The statement follows:

CHECK FIGURE
 (1a) Break-even:
 \$12,000,000



Pittman Company Budgeted Income Statement For the Year Ended December 31		
Sales.....		\$16,000,000
Manufacturing costs:		
Variable.....	\$7,200,000	
Fixed overhead.....	2,340,000	9,540,000
Gross margin.....		6,460,000
Selling and administrative costs:		
Commissions to agents.....	2,400,000	
Fixed marketing costs.....	120,000*	
Fixed administrative costs.....	1,800,000	4,320,000
Net operating income.....		2,140,000
Fixed interest cost.....		540,000
Income before income taxes.....		1,600,000
Income taxes (30%).....		480,000
Net income.....		<u>\$ 1,120,000</u>

*Primarily depreciation on storage facilities.

As Barbara handed the statement to Karl Vecchi, Pittman’s president, she commented, “I went ahead and used the agents’ 15% commission rate in completing these statements, but we’ve just learned that they refuse to handle our products next year unless we increase the commission rate to 20%.”

“That’s the last straw,” Karl replied angrily. “Those agents have been demanding more and more, and this time they’ve gone too far. How can they possibly defend a 20% commission rate?”

“They claim that after paying for advertising, travel, and the other costs of promotion, there’s nothing left over for profit,” replied Barbara.

“I say it’s just plain robbery,” retorted Karl. “And I also say it’s time we dumped those guys and got our own sales force. Can you get your people to work up some cost figures for us to look at?”

“We’ve already worked them up,” said Barbara. “Several companies we know about pay a 7.5% commission to their own salespeople, along with a small salary. Of course, we would have to handle all promotion costs, too. We figure our fixed costs would increase by \$2,400,000 per year, but that would be more than offset by the \$3,200,000 (20% × \$16,000,000) that we would avoid on agents’ commissions.”

The breakdown of the \$2,400,000 cost follows:

Salaries:	
Sales manager.....	\$ 100,000
Salespersons.....	600,000
Travel and entertainment.....	400,000
Advertising.....	1,300,000
Total.....	<u>\$2,400,000</u>

“Super,” replied Karl. “And I noticed that the \$2,400,000 is just what we’re paying the agents under the old 15% commission rate.”

“It’s even better than that,” explained Barbara. “We can actually save \$75,000 a year because that’s what we’re having to pay the auditing firm now to check out the agents’ reports. So our overall administrative costs would be less.”

“Pull all of these numbers together and we’ll show them to the executive committee tomorrow,” said Karl. “With the approval of the committee, we can move on the matter immediately.”

Required:

1. Compute Pittman Company’s break-even point in sales dollars for next year assuming:
 - a. The agents’ commission rate remains unchanged at 15%.
 - b. The agents’ commission rate is increased to 20%.
 - c. The company employs its own sales force.
2. Assume that Pittman Company decides to continue selling through agents and pays the 20% commission rate. Determine the volume of sales that would be required to generate the same net income as contained in the budgeted income statement for next year.
3. Determine the volume of sales at which net income would be equal regardless of whether Pittman Company sells through agents (at a 20% commission rate) or employs its own sales force.
4. Compute the degree of operating leverage that the company would expect to have on December 31 at the end of next year assuming:
 - a. The agents’ commission rate remains unchanged at 15%.
 - b. The agents’ commission rate is increased to 20%.
 - c. The company employs its own sales force.
 Use income *before* income taxes in your operating leverage computation.
5. Based on the data in (1) through (4) above, make a recommendation as to whether the company should continue to use sales agents (at a 20% commission rate) or employ its own sales force. Give reasons for your answer.

(CMA, adapted)



TEAMWORK IN ACTION [LO1, LO4]

Revenue from major intercollegiate sports is an important source of funds for many colleges. Most of the costs of putting on a football or basketball game may be fixed and may increase very little as the size of the crowd increases. Thus, the revenue from every extra ticket sold may be almost pure profit.

Choose a sport played at your college or university, such as football or basketball, that generates significant revenue. Talk with the business manager of your college’s sports programs before answering the following questions:

Required:

1. What is the maximum seating capacity of the stadium or arena in which the sport is played? During the past year, what was the average attendance at the games? On average, what percentage of the stadium or arena capacity was filled?
2. The number of seats sold often depends on the opponent. The attendance for a game with a traditional rival (e.g., Nebraska vs. Colorado, University of Washington vs. Washington State, or Texas vs. Texas A&M) is usually substantially above the average. Also, games against conference foes may draw larger crowds than other games. As a consequence, the number of tickets sold for a game is somewhat predictable. What implications does this have for the nature of the costs of putting on a game? Are most of the costs really fixed with respect to the number of tickets sold?
3. Estimate the variable cost per ticket sold.
4. Estimate the total additional revenue that would be generated in an average game if all of the tickets were sold at their normal prices. Estimate how much profit is lost because these tickets are not sold.
5. Estimate the ancillary revenue (parking and concessions) per ticket sold. Estimate how much profit is lost in an average game from these sources of revenue as a consequence of not having a sold-out game.
6. Estimate how much additional profit would be generated for your college if every game were sold out for the entire season.



RESEARCH AND APPLICATION

[LO3, LO4, LO5, LO6, LO7, LO8, LO9]

The questions in this exercise are based on the **Benetton Group**, a company headquartered in Italy and known in the United States primarily for one of its brands of fashion apparel—United Colors of Benetton. To answer the questions, you will need to download the Benetton Group’s 2004 Annual Report at <http://investors.benettongroup.com>. Once at this website, click on the link at the bottom of the page called “Site Map” and then scroll down to the heading called

"Financial Reports" and click on that link and then click on the year 2004. You do not need to print this document to answer the questions.

Required:

1. How do the formats of the income statements shown on pages 33 and 50 of Benetton's annual report differ from one another (disregard everything beneath the line titled "income from operations")? Which expenses shown on page 50 appear to have been reclassified as variable selling costs on page 33?
2. Why do you think cost of sales is included in the computation of contribution margin on page 33?
3. Perform two separate computations of Benetton's break-even point in euros. For the first computation, use data from 2003. For the second computation, use data from 2004. Why do the numbers that you computed differ from one another?
4. What sales volume would have been necessary in 2004 for Benetton to attain a target income from operations of €300 million?
5. Compute Benetton's margin of safety using data from 2003 and 2004. Why do your answers for the two years differ from one another?
6. What is Benetton's degree of operating leverage in 2004? If Benetton's sales in 2004 had been 6% higher than what is shown in the annual report, what income from operations would the company have earned? What percentage increase in income from operations does this represent?
7. What income from operations would Benetton have earned in 2004 if it had invested an additional €10 million in advertising and promotions and realized a 3% increase in sales? As an alternative, what income from operations would Benetton have earned if it not only invested an additional €10 million in advertising and promotions but also raised its sales commission rate to 6% of sales, thereby generating a 5% increase in sales? Which of these two scenarios would have been preferable for Benetton?
8. Assume that total sales in 2004 remained unchanged at €1,686 million (as shown on pages 33 and 50); however, the Casual sector sales were €1,554 million, the Sportswear and Equipment sector sales were €45 million, and the Manufacturing and Other sector sales were €87 million. What income from operations would Benetton have earned with this sales mix? (Hint: look at pages 36 and 37 of the annual report.) Why is the income from operations under this scenario different from what is shown in the annual report?

7

Profit Planning

<< A LOOK BACK

Chapter 6 explained how to compute a break-even point and how to determine the sales needed to achieve a desired profit. We also described how to compute and use the margin of safety and operating leverage.

A LOOK AT THIS CHAPTER

After discussing why organizations prepare budgets and the process they use to create a budget, Chapter 7 overviews each of the parts of a master budget including the cash budget, the budgeted income statement, and the budgeted balance sheet.

A LOOK AHEAD >>

In Chapter 8, we turn our attention from the planning process to management control and performance measures, focusing on the use of flexible budgets and variance analysis.

CHAPTER OUTLINE

The Basic Framework of Budgeting

- Advantages of Budgeting
- Responsibility Accounting
- Choosing a Budget Period
- The Self-Imposed Budget
- Human Factors in Budgeting
- The Budget Committee
- The Master Budget: An Overview

Preparing the Master Budget

- The Sales Budget
- The Production Budget

- Inventory Purchases—Merchandising Company
- The Direct Materials Budget
- The Direct Labor Budget
- The Manufacturing Overhead Budget
- The Ending Finished Goods Inventory Budget
- The Selling and Administrative Expense Budget
- The Cash Budget
- The Budgeted Income Statement
- The Budgeted Balance Sheet



Lilo & Stitch on Budget

The full-length feature cartoon *Tarzan* grossed about \$450 million worldwide for **The Walt Disney Company**. However, production costs got out of control. The company traditionally manages film production by focusing on meeting the planned release date—paying little attention to costs. In the case of *Tarzan*, production fell behind schedule due to the tendency of animation teams to add more eye-dazzling complexity to each production. At one point, it was estimated that 190,000 individual drawings would be needed to complete the film in contrast to the 130,000 drawings needed to complete *The Lion King*. To meet *Tarzan*'s release date, workers were pulled off other productions and were often paid at overtime rates. The size of the film crew eventually reached 573, which was nearly twice the size of the crew that had made *The Lion King*. With animators earning salaries in the hundreds of thousands of dollars, the cost implications were staggering.

Thomas S. Schumacher, Disney's feature-animation chief, was charged with dramatically reducing the cost of future films while making sure that the audience wouldn't notice any decline in quality. *Lilo & Stitch* was the first film to be produced with this goal in mind. The process began by prioritizing where the money was to be spent. The budget for music was kept generous; animation costs were cut by controlling the small details that add big costs with little effect on the quality of the film. For example, animators wanted to draw cute designs on the shirts worn by Nani, Lilo's big sister. However, adding this level of detail on every frame in which Nani appears in the film would have added about \$250,000 in cost. By controlling such details, *Lilo & Stitch* was finished on time and at a cost of about \$80 million. This contrasted with a cost of more than \$150 million for *Tarzan*.

Source: Bruce Orwall, "Comics Stripped: At Disney, String of Weak Cartoons Leads to Cost Cuts," *The Wall Street Journal*, June 18, 2002, pp. A1 and A8.

LEARNING OBJECTIVES



After studying Chapter 7, you should be able to:

- LO1** Understand why organizations budget and the processes they use to create budgets.
- LO2** Prepare a sales budget, including a schedule of expected cash collections.
- LO3** Prepare a production budget.
- LO4** Prepare a direct materials budget, including a schedule of expected cash disbursements for purchases of materials.
- LO5** Prepare a direct labor budget.
- LO6** Prepare a manufacturing overhead budget.
- LO7** Prepare a selling and administrative expense budget.
- LO8** Prepare a cash budget.
- LO9** Prepare a budgeted income statement.
- LO10** Prepare a budgeted balance sheet.

In this chapter, we focus on the steps taken by businesses to achieve their planned levels of profits—a process called *profit planning*. Profit planning is accomplished by preparing a number of budgets that together form an integrated business plan known as the *master budget*. The master budget is an essential management tool that communicates management's plans throughout the organization, allocates resources, and coordinates activities.

THE BASIC FRAMEWORK OF BUDGETING

LEARNING OBJECTIVE 1

Understand why organizations budget and the processes they use to create budgets.



A **budget** is a quantitative plan for acquiring and using resources over a specified time period. Individuals sometimes create household budgets that balance their income and expenditures for food, clothing, housing, and so on while providing for some savings. Once the budget is established, actual spending is compared to the budget to make sure the plan is being followed. Companies use budgets in a similar way, although the amount of work and underlying details far exceed a personal budget.

Budgets are used for two distinct purposes—*planning* and *control*. **Planning** involves developing goals and preparing various budgets to achieve those goals. **Control** involves the steps taken by management to increase the likelihood that all parts of the organization are working together to achieve the goals set down at the planning stage. To be effective, a good budgeting system must provide for both planning and control. Good planning without effective control is a waste of time and effort.

Advantages of Budgeting

Organizations realize many benefits from budgeting including:

1. Budgets *communicate* management's plans throughout the organization.
2. Budgets force managers to *think about* and *plan* for the future. In the absence of the necessity to prepare a budget, many managers would spend all of their time dealing with day-to-day emergencies.
3. The budgeting process provides a means of *allocating resources* to those parts of the organization where they can be used most effectively.
4. The budgeting process can uncover potential *bottlenecks* before they occur.
5. Budgets *coordinate* the activities of the entire organization by *integrating* the plans of its various parts. Budgeting helps to ensure that everyone in the organization is pulling in the same direction.
6. Budgets define goals and objectives that can serve as *benchmarks* for evaluating subsequent performance.

Responsibility Accounting

Most of what we say in this chapter and in the next three chapters is concerned with *responsibility accounting*. The basic idea underlying **responsibility accounting** is that a manager should be held responsible for those items—and *only* those items—that the manager can actually control to a significant extent. Each line item (i.e., revenue or cost) in the budget is the responsibility of a manager who is held responsible for subsequent deviations between budgeted goals and actual results. In effect, responsibility accounting *personalizes* accounting information by holding individuals responsible for revenues and costs. This concept is central to any effective profit planning and control system. Someone must be held responsible for each cost or else no one will be responsible and the cost will inevitably grow out of control.

What happens if actual results do not measure up to the budgeted goals? The manager is not necessarily penalized. However, the manager should take the initiative to correct any unfavorable discrepancies, should understand the source of significant favorable or unfavorable discrepancies, and should be prepared to explain the reasons for discrepancies to higher management. The point of an effective responsibility accounting system is to

New York City Mayor Benefits From Budgets

IN BUSINESS

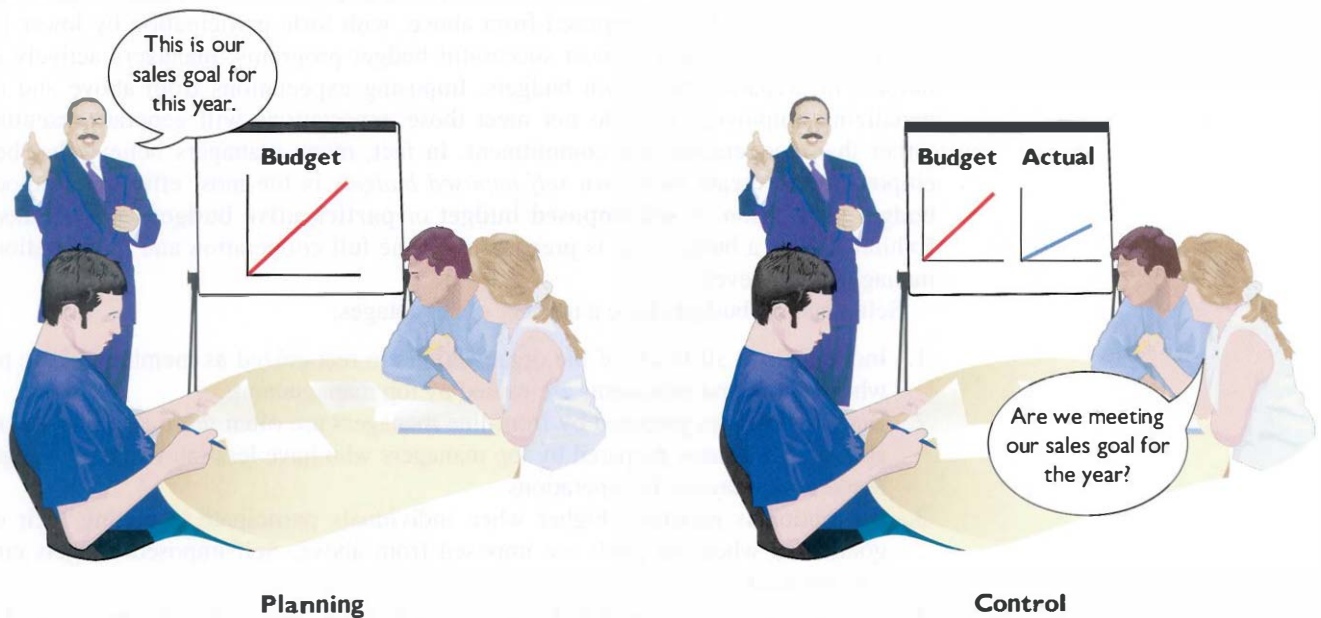
Michael Bloomberg, the mayor of **New York City**, makes annual budget presentations to his fellow elected officials, the city council, and the media. Historically, the city's mayors had delegated these types of presentations to one of their budget directors; however, Bloomberg believes that by investing his time in explaining the factors influencing the city's economy, his constituents will gain a better understanding of his fiscal priorities. This, in turn, helps improve his negotiations with the city council and his relationships with various advocacy groups. The mayor also makes his entire budget available online so that New Yorkers can scrutinize budgeting details, such as the cost of running specific government agencies.



Source: Tom Lowry, "The CEO Mayor," *BusinessWeek*, June 25, 2007, pp. 58–64.

make sure that nothing "falls through the cracks," that the organization reacts quickly and appropriately to deviations from its plans, and that the organization learns from the feedback it gets by comparing budgeted goals to actual results. The point is *not* to penalize individuals for missing targets.

Planning and Control



Choosing a Budget Period

Operating budgets ordinarily cover a one-year period corresponding to the company's fiscal year. Many companies divide their budget year into four quarters. The first quarter is then subdivided into months, and monthly budgets are developed. The last three quarters may be carried in the budget as quarterly totals only. As the year progresses, the figures for the second quarter are broken down into monthly amounts, then the third-quarter figures are broken down, and so forth. This approach has the advantage of requiring periodic review and reappraisal of budget data throughout the year.

Continuous or perpetual budgets are sometimes used. A **continuous** or **perpetual budget** is a 12-month budget that rolls forward one month (or quarter) as the current month (or quarter) is completed. In other words, one month (or quarter) is added to the end of the budget as each month (or quarter) comes to a close. This approach keeps managers focused at least one year ahead so that they do not become too narrowly focused on short-term results.

IN BUSINESS

Keeping Current



Jim Bell, **Hunstman Corp.**'s director of corporate finance, says that his company must frequently update its budgets and its forecasts to meet the demands of investors, creditors, and others. The company updates its annual budget each month, using the most recent data, to provide greater accuracy as the year unfolds. The budget is also used together with sophisticated modeling software to evaluate what effects decisions and various changes in input prices and other parameters might have on future results.

Source: Tim Reason, "Partial Clearing," *CFO*, December 2002, pp. 73–76.

In this chapter, we will look at one-year operating budgets. However, using basically the same techniques, operating budgets can be prepared for periods that extend over many years. It may be difficult to accurately forecast sales and other data much beyond a year, but even rough estimates can be invaluable in uncovering potential problems and opportunities that would otherwise be overlooked.

The Self-Imposed Budget

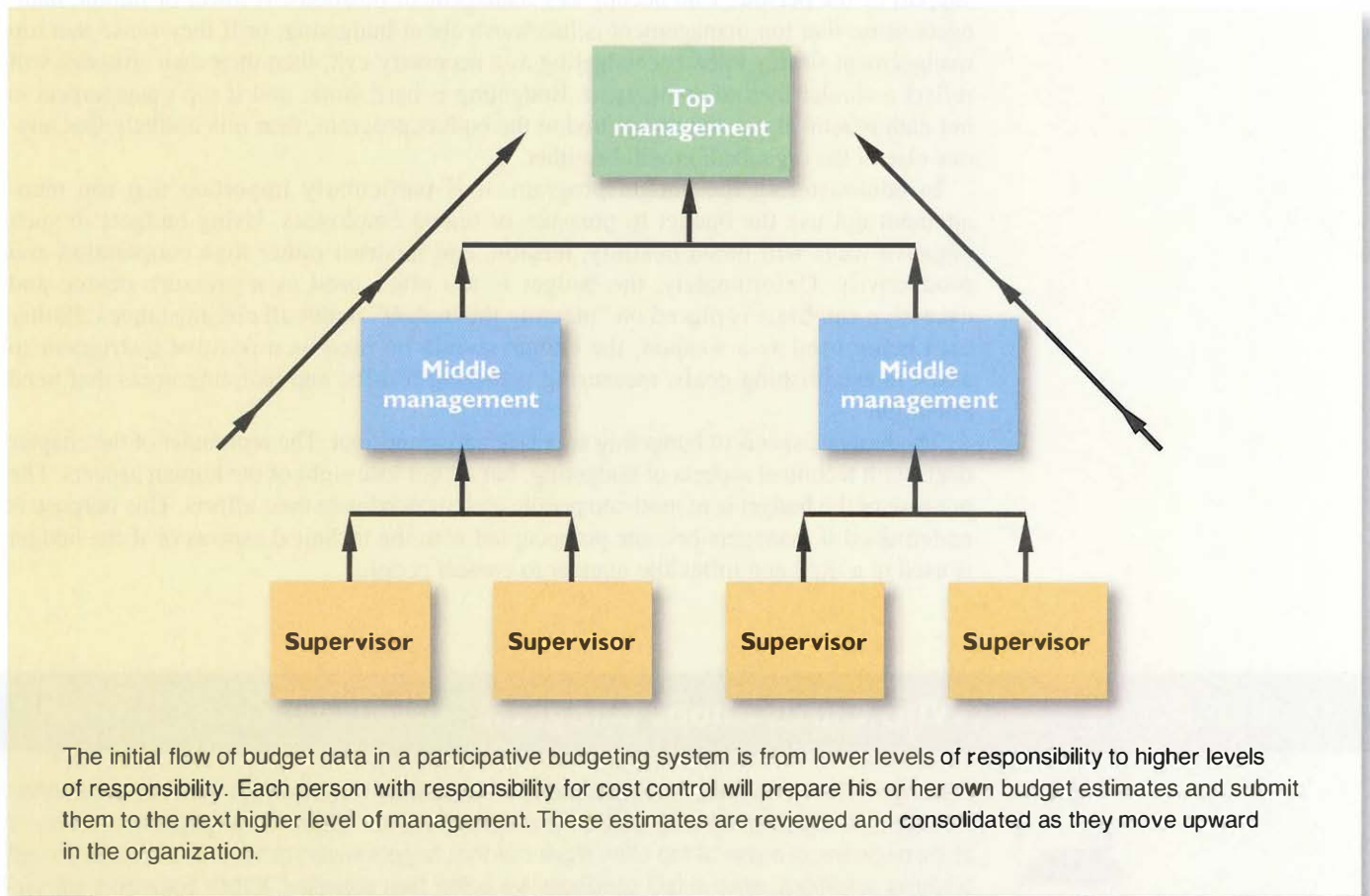
The success of a budget program is largely determined by the way a budget is developed. Oftentimes, the budget is imposed from above, with little participation by lower-level managers. However, in the most successful budget programs, managers actively participate in preparing their own budgets. Imposing expectations from above and then penalizing employees who do not meet those expectations will generate resentment rather than cooperation and commitment. In fact, many managers believe that being empowered to create their own *self-imposed budgets* is the most effective method of budget preparation. A **self-imposed budget** or **participative budget**, as illustrated in Exhibit 7-1, is a budget that is prepared with the full cooperation and participation of managers at all levels.

Self-imposed budgets have a number of advantages:

1. Individuals at all levels of the organization are recognized as members of the team whose views and judgments are valued by top management.
2. Budget estimates prepared by front-line managers are often more accurate and reliable than estimates prepared by top managers who have less intimate knowledge of markets and day-to-day operations.
3. Motivation is generally higher when individuals participate in setting their own goals than when the goals are imposed from above. Self-imposed budgets create commitment.
4. A manager who is not able to meet a budget that has been imposed from above can always say that the budget was unrealistic and impossible to meet. With a self-imposed budget, this excuse is not available.

One important limitation of self-imposed budgeting is that lower-level managers may allow too much *budgetary slack*. Since the manager who creates the budget will be held accountable for actual results that deviate from the budget, the manager will have a natural tendency to submit a budget that is easy to attain (i.e., the manager will build slack into the budget). For this reason, budgets prepared by lower-level managers should be scrutinized by higher levels of management. Questionable items should be discussed and modified as appropriate. Without such a review, self-imposed budgets may be too slack, resulting in suboptimal performance.

As these comments suggest, all levels in the organization should work together to produce the budget. Lower-level managers are more familiar with day-to-day operations than top managers. Top managers should have a more strategic perspective than lower-level managers. Each level of responsibility in an organization should contribute

EXHIBIT 7-1 The Initial Flow of Budget Data in a Participative Budgeting System

its unique knowledge and perspective in a cooperative effort to develop an integrated budget. Nevertheless, a self-imposed approach to setting budgets works best when all managers understand the organization's strategy. Otherwise, the budgets proposed by the lower-level managers will lack coherent direction. In later chapters, we discuss in greater detail how a company can go about formulating its strategy and communicating it throughout the organization.

Unfortunately, most companies do not follow the budgeting process we have described. Typically, top managers initiate the budgeting process by issuing profit targets. Lower-level managers are directed to prepare budgets that meet those targets. The difficulty is that the targets set by top managers may be unrealistically high or may allow too much slack. If the targets are too high and employees know they are unrealistic, motivation will suffer. If the targets allow too much slack, waste will occur. Unfortunately, top managers are often not in a position to know whether the targets are appropriate. Admittedly, a self-imposed budgeting system may lack sufficient strategic direction and lower-level managers may be tempted to build slack into their budgets. Nevertheless, because of the motivational advantages of self-imposed budgets, top managers should be cautious about imposing inflexible targets from above.

Human Factors in Budgeting

The success of a budget program also depends on the degree to which top management accepts the budget program as a vital part of the company's activities and the way in which top management uses budgeted data.

If a budget program is to be successful, it must have the complete acceptance and support of the persons who occupy key management positions. If lower or middle managers sense that top management is lukewarm about budgeting, or if they sense that top management simply tolerates budgeting as a necessary evil, then their own attitudes will reflect a similar lack of enthusiasm. Budgeting is hard work, and if top management is not enthusiastic about and committed to the budget program, then it is unlikely that anyone else in the organization will be either.

In administering the budget program, it is particularly important that top management not use the budget to pressure or blame employees. Using budgets in such negative ways will breed hostility, tension, and mistrust rather than cooperation and productivity. Unfortunately, the budget is too often used as a pressure device and excessive emphasis is placed on “meeting the budget” under all circumstances. Rather than being used as a weapon, the budget should be used as a positive instrument to assist in establishing goals, measuring operating results, and isolating areas that need attention.

The human aspects of budgeting are extremely important. The remainder of the chapter deals with technical aspects of budgeting, but do not lose sight of the human aspects. The purpose of the budget is to motivate people and to coordinate their efforts. This purpose is undermined if managers become preoccupied with the technical aspects or if the budget is used in a rigid and inflexible manner to control people.

IN BUSINESS

Who Cares about Budgets?



Towers Perrin, a consulting firm, reports that the bonuses of more than two out of three corporate managers are based on meeting targets set in annual budgets. “Under this arrangement, managers at the beginning of a year all too often argue that their targets should be lowered because of tough business conditions, when in fact conditions are better than projected. If their arguments are successful, they can easily surpass the targets.”

Source: Ronald Fink and Towers Perrin, “Riding the Bull: The 2000 Compensation Survey,” *CFO*, June 2000, pp. 45–60.

How challenging should budget targets be? Some experts argue that budget targets should be very challenging and should require managers to stretch to meet goals. Even the most capable managers may have to scramble to meet such a “stretch budget” and they may not always succeed. In practice, most companies set their budget targets at a “highly achievable” level. A highly achievable budget may be challenging, but it can almost always be met by competent managers exerting reasonable effort.

Bonuses based on meeting and exceeding budgets are often a key element of management compensation. Typically, no bonus is paid unless the budget is met. The bonus often increases when the budget target is exceeded, but the bonus is usually capped out at some level. For obvious reasons, managers who have such a bonus plan or whose performance is evaluated based on meeting budget targets usually prefer to be evaluated based on highly achievable budgets rather than on stretch budgets. Moreover, highly achievable budgets may help build a manager’s confidence and generate greater commitment to the budget. And finally, highly achievable budgets may result in less undesirable behavior at the end of budgetary periods by managers who are intent on earning their bonuses. Examples of such undesirable behaviors are presented in several of the In Business boxes in this chapter.

Biasing Forecasts

IN BUSINESS

A manager's compensation is often tied to the budget. Typically, no bonus is paid unless a minimum performance hurdle such as 80% of the budget target is attained. Once that hurdle is passed, the manager's bonus increases until a cap is reached. That cap is often set at 120% of the budget target.

This common method of tying a manager's compensation to the budget has some serious negative side effects. For example, a marketing manager for a big beverage company intentionally grossly understated demand for the company's products for an upcoming major holiday so that the budget target for revenues would be low and easy to beat. Unfortunately, the company tied its production to this biased forecast and ran out of products to sell during the height of the holiday selling season.

As another example, near the end of the year another group of managers announced a price increase of 10% effective January 2 of the following year. Why would they do this? By announcing this price increase, managers hoped that customers would order before the end of the year, helping managers meet their sales targets for the current year. Sales in the following year would, of course, drop. What trick would managers pull to meet their sales targets next year in the face of this drop in demand?



Sources: Michael C. Jensen, "Corporate Budgeting Is Broken—Let's Fix It," *Harvard Business Review*, November 2001; and Michael C. Jensen, "Why Pay People to Lie?" *The Wall Street Journal*, January 8, 2001, p. A32.

The Budget Committee

A standing **budget committee** is usually responsible for overall policy relating to the budget program and for coordinating the preparation of the budget itself. This committee may consist of the president; vice presidents in charge of various functions such as sales, production, and purchasing; and the controller. Difficulties and disputes relating to the budget are resolved by the budget committee. In addition, the budget committee approves the final budget.

Disputes can (and do) erupt over budget matters. Because budgets allocate resources, the budgeting process determines to a large extent which departments get more resources and which get less. Also, the budget sets the benchmarks used to evaluate managers and their departments. Therefore, it should not be surprising that managers take the budgeting process very seriously and invest considerable energy and emotion in ensuring that their interests, and those of their departments, are protected. Because of this, the budgeting process can easily degenerate into an interoffice brawl in which the ultimate goal of working together toward common goals is forgotten.

Running a successful budgeting program that avoids interoffice battles requires considerable interpersonal skills in addition to purely technical skills. But even the best interpersonal skills will fail if, as discussed earlier, top management uses the budget process to inappropriately pressure employees or to assign blame.

Better than Budgets?

IN BUSINESS

Borealis is a company headquartered in Copenhagen, Denmark, that produces polymers for the plastics industry. Thomas Boesen, the company's financial controller, felt that the traditional budgeting process had outlived its usefulness—markets were changing so fast that the budget was out of date within weeks of its publication. Moreover, because budgets were used to control and evaluate the performance of managers, they were subject to considerable gaming behavior that reduced their accuracy and usefulness. So over a five-year period the company phased out its traditional budgets and replaced them with rolling forecasts and several other management tools. Instead of holding managers to a budget, targets based on competitors' performance were set for variable costs, fixed costs, and operating margins. Managers were given the freedom to

IN BUSINESS

(continued)

spend money as needed to meet these competitive benchmarks. Because the rolling forecasts of financial results were not used to control spending or to evaluate managers' performance, managers had little incentive to "game the system," and hence the forecasts were more accurate than those obtained through the traditional budgeting process.

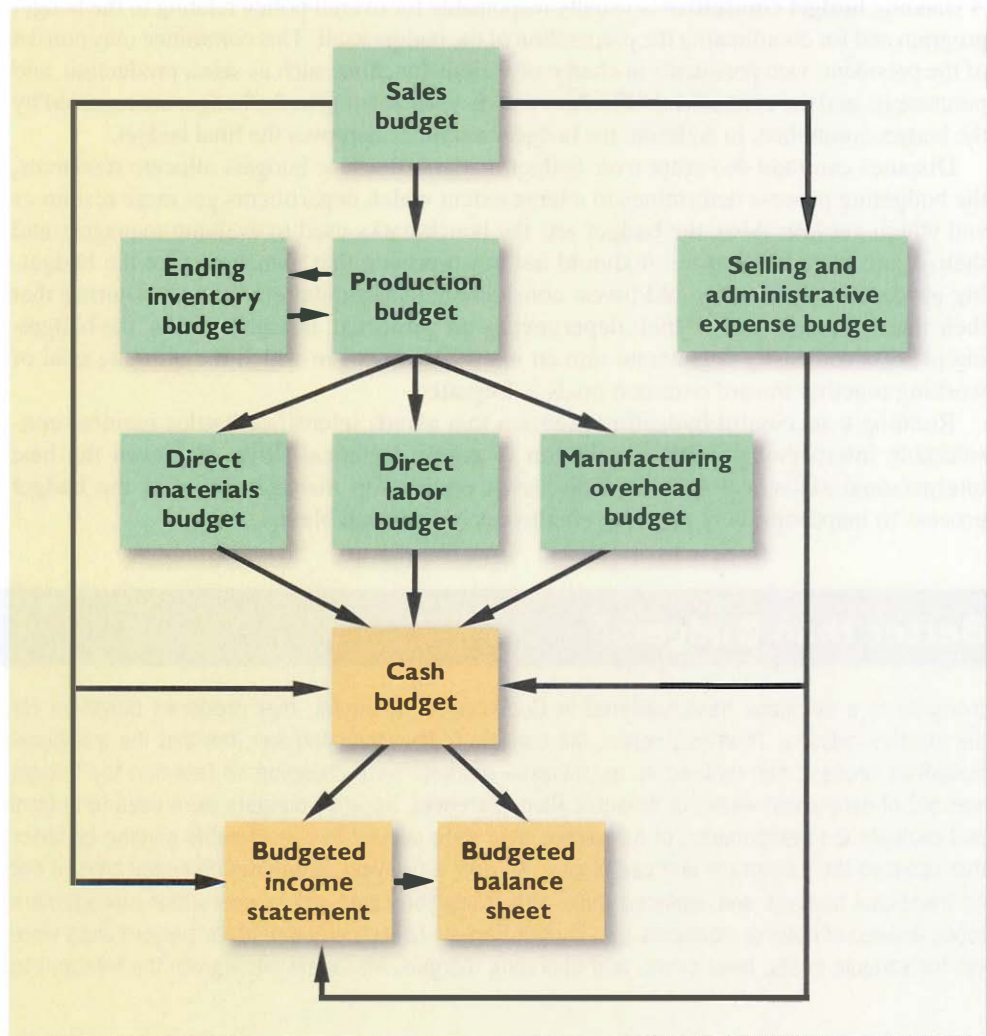
Source: Professor Bjorn Jorgensen, *Borealis*, Harvard Business School Case 9-102-048, Rev: May 9, 2002.

The Master Budget: An Overview

The **master budget** consists of a number of separate but interdependent budgets that formally lay out the company's sales, production, and financial goals. The master budget culminates in a cash budget, a budgeted income statement, and a budgeted balance sheet. Exhibit 7-2 provides an overview of the various parts of the master budget and how they are related.

The first step in the budgeting process is the preparation of the **sales budget**, which is a detailed schedule showing the expected sales for the budget period. An accurate sales budget is the key to the entire budgeting process. As illustrated in Exhibit 7-2, all other parts of the master budget depend on the sales budget. If the sales budget is inaccurate, the rest of the budget will be inaccurate. The sales budget is based on the company's sales

EXHIBIT 7-2
The Master Budget
Interrelationships



forecast, which may require the use of sophisticated mathematical models and statistical tools. We will not go into the details of how sales forecasts are made. This is a subject that is most appropriately covered in marketing courses.

The sales budget helps determine how many units need to be produced. Thus, the production budget is prepared after the sales budget. The production budget in turn is used to determine the budgets for manufacturing costs including the direct materials budget, the direct labor budget, and the manufacturing overhead budget. These budgets are then combined with data from the sales budget and the selling and administrative expense budget to determine the *cash budget*. A **cash budget** is a detailed plan showing how cash resources will be acquired and used. Observe from Exhibit 7–2 that all of the operating budgets have an impact on the cash budget. After the cash budget is prepared, the budgeted income statement and then the budgeted balance sheet can be prepared.

Be Realistic

IN BUSINESS

Gillette, the company that makes razors and other consumer products, got into trouble trying to meet increasingly unrealistic sales targets. The buyer at one of the company's big retail customers told Gillette's new CEO, Jim Kilts, that "he always waited until the last week of the quarter to order anything from Gillette 'because I know that you will always cut a deal.' To hit their numbers each quarter, [the Gillette salespersons] were willing to do anything—offer cut-rate deals, rearrange product packaging—whatever it took to make the sale." This resulted in artificially large sales at the end of the quarter—disrupting production schedules and loading the retail stores with excess inventory at discounted prices that would have to be sold off before more inventory would be ordered from Gillette.

Source: Katrina Brooker, "Jim Kilts Is an Old-School Curmudgeon," *Fortune*, December 30, 2002, pp. 95–102.

PREPARING THE MASTER BUDGET

Tom Wills is the majority stockholder and chief executive officer of Hampton Freeze, Inc., a company he started in 2006. The company makes premium popsicles using only natural ingredients and featuring exotic flavors such as tangy tangerine and minty mango. The company's business is highly seasonal, with most of the sales occurring in spring and summer.

In 2007, the company's second year of operations, a major cash crunch in the first and second quarters almost forced the company into bankruptcy. In spite of this cash crunch, 2007 turned out to be a very successful year in terms of both cash flow and net income. Partly as a result of that harrowing experience, Tom decided toward the end of 2007 to hire a professional financial manager. Tom interviewed several promising candidates for the job and settled on Larry Giano, who had considerable experience in the packaged foods industry. In the job interview, Tom questioned Larry about the steps he would take to prevent a recurrence of the 2007 cash crunch:

Tom: As I mentioned earlier, we are going to end 2007 with a very nice profit. What you may not know is that we had some very big financial problems this year.

Larry: Let me guess. You ran out of cash sometime in the first or second quarter.

Tom: How did you know?

Larry: Most of your sales are in the second and third quarter, right?

Tom: Sure, everyone wants to buy popsicles in the spring and summer, but nobody wants them when the weather turns cold.

Larry: So you don't have many sales in the first quarter?

Tom: Right.

Larry: And in the second quarter, which is the spring, you are producing like crazy to fill orders?

**MANAGERIAL
ACCOUNTING IN
ACTION**
The Issue



Tom: Sure.

Larry: Do your customers, the grocery stores, pay you the day you make your deliveries?

Tom: Are you kidding? Of course not.

Larry: So in the first quarter, you don't have many sales. In the second quarter, you are producing like crazy, which eats up cash, but you aren't paid by your customers until long after you have paid your employees and suppliers. No wonder you had a cash problem. I see this pattern all the time in food processing because of the seasonality of the business.

Tom: So what can we do about it?

Larry: The first step is to predict the magnitude of the problem before it occurs. If we can predict early in the year what the cash shortfall is going to be, we can go to the bank and arrange for credit before we really need it. Bankers tend to be leery of panicky people who show up begging for emergency loans. They are much more likely to make the loan if you look like you are in control of the situation.

Tom: How can we predict the cash shortfall?

Larry: You can put together a cash budget. While you're at it, you might as well do a master budget. You'll find it is well worth the effort.

Tom: I don't like budgets. They are too confining. My wife budgets everything at home, and I can't spend what I want.

Larry: Can I ask a personal question?

Tom: What?

Larry: Where did you get the money to start this business?

Tom: Mainly from our family's savings. I get your point. We wouldn't have had the money to start the business if my wife hadn't been forcing us to save every month.

Larry: Exactly. I suggest you use the same discipline in your business. It is even more important here because you can't expect your employees to spend your money as carefully as you would.

With the full backing of Tom Wills, Larry Giano set out to create a master budget for the company for the year 2008. In his planning for the budgeting process, Larry drew up the following list of documents that would be a part of the master budget:

1. A sales budget, including a schedule of expected cash collections.
2. A production budget (a merchandise purchases budget would be used in a merchandising company).
3. A direct materials budget, including a schedule of expected cash disbursements for purchases of materials.
4. A direct labor budget.
5. A manufacturing overhead budget.
6. An ending finished goods inventory budget.
7. A selling and administrative expense budget.
8. A cash budget.
9. A budgeted income statement.
10. A budgeted balance sheet.

Larry felt it was important to have everyone's cooperation in the budgeting process, so he asked Tom to call a companywide meeting to explain the budgeting process. At the meeting there was initially some grumbling, but Tom was able to convince nearly everyone of the necessity for planning and getting better control over spending. It helped that the cash crisis earlier in the year was still fresh in everyone's minds. As much as some people disliked the idea of budgets, they liked their jobs more.

In the months that followed, Larry worked closely with all of the managers involved in the master budget, gathering data from them and making sure that they understood and fully supported the parts of the master budget that would affect them. In subsequent years, Larry hoped to turn the whole budgeting process over to the managers and to take a more advisory role.

The interdependent documents that Larry Giano prepared for Hampton Freeze are Schedules 1 through 10 of the company’s master budget. In this section, we will study these schedules.

The Sales Budget

The sales budget is the starting point in preparing the master budget. As shown earlier in Exhibit 7–2, all other items in the master budget, including production, purchases, inventories, and expenses, depend on it.

The sales budget is constructed by multiplying budgeted unit sales by the selling price. Schedule 1 contains the quarterly sales budget for Hampton Freeze for the year 2008. Notice from the schedule that the company plans to sell 100,000 cases of popsicles during the year, with sales peaking in the third quarter.

LEARNING OBJECTIVE 2

Prepare a sales budget, including a schedule of expected cash collections.



SCHEDULE 1

Hampton Freeze, Inc. Sales Budget For the Year Ended December 31, 2008					
	Quarter				Year
	1	2	3	4	
Budgeted sales in cases	10,000	30,000	40,000	20,000	100,000
Selling price per case	\$ 20.00	\$ 20.00	\$ 20.00	\$ 20.00	\$ 20.00
Total sales	\$200,000	\$600,000	\$800,000	\$400,000	\$2,000,000
Percentage of sales collected in the period of the sale			70%		
Percentage of sales collected in the period after the sale			30%		
Schedule of Expected Cash Collections					
Accounts receivable, beginning balance ¹	\$ 90,000				\$ 90,000
First-quarter sales ²	140,000	\$ 60,000			200,000
Second-quarter sales ³		420,000	\$ 180,000		600,000
Third-quarter sales ⁴			560,000	\$ 240,000	800,000
Fourth-quarter sales ⁵				280,000	280,000
Total cash collections ⁶	\$230,000	\$480,000	\$740,000	\$520,000	\$1,970,000

¹Cash collections from last year’s fourth-quarter sales. See the beginning-of-year balance sheet on page 332.

²\$200,000 × 70%; \$200,000 × 30%.

³\$600,000 × 70%; \$600,000 × 30%.

⁴\$800,000 × 70%; \$800,000 × 30%.

⁵\$400,000 × 70%.

⁶Uncollected fourth-quarter sales appear as accounts receivable on the company’s end-of-year budgeted balance sheet (see Schedule 10 on page 333).

A schedule of expected cash collections, such as the one that appears in the bottom portion of Schedule 1, is prepared after the sales budget. This schedule will be needed later to prepare the cash budget. Cash collections consist of collections on credit sales made to customers in prior periods plus collections on sales made in the current budget period. At Hampton Freeze all sales are on credit; furthermore, experience has shown that 70% of sales are collected in the quarter in which the sale is made and the remaining 30% are collected in the following quarter. For example, 70% of the first quarter sales of \$200,000 (or \$140,000) is collected during the first quarter and 30% (or \$60,000) is collected during the second quarter.

IN BUSINESS

The Importance of Sales Risk Management



David Flynn founded **Amistad Media Group** in 1994 to help companies market themselves to growing Hispanic communities in places such as Nebraska, Kansas, and North Carolina. While Amistad's sales steadily grew to a peak of \$49 million in 2003, its customer base had not grown much in nine years. In fact, just two companies generated the bulk of Amistad's sales—**Novamex** and the **U.S. Army**. When the U.S. Army dropped Amistad as a supplier in 2005, the company's sales plummeted and it was bankrupt by 2006.

Amistad's demise highlights the importance of evaluating a company's sales forecast not only in terms of dollars, but also in terms of the number of customers served. Small companies in particular should seek to diversify their customer base, thereby reducing the risk that losing one or two customers will put them out of business.

Source: Patrick Cliff, "Adios to a Pioneering Hispanic Marketing Firm," *Inc.* magazine, May 2006, p. 34.

CONCEPT CHECK ✓

- March, April, and May sales are \$100,000, \$120,000, and \$125,000, respectively. A total of 80% of all sales are credit sales and 20% are cash sales. A total of 60% of credit sales are collected in the month of the sale and 40% are collected in the next month. There are no bad debt expenses. What is the amount of cash collections for April?
 - \$89,600
 - \$111,600
 - \$113,600
 - \$132,600
- Referring to the facts in question 1 above, what is the accounts receivable balance at the end of May?
 - \$40,000
 - \$50,000
 - \$72,000
 - \$80,000

The Production Budget

The production budget is prepared after the sales budget. The **production budget** lists the number of units that must be produced to satisfy sales needs and to provide for the desired ending inventory. Production needs can be determined as follows:

LEARNING OBJECTIVE 3

Prepare a production budget.

Budgeted unit sales	XXXX
Add desired ending inventory	XXXX
Total needs	XXXX
Less beginning inventory.....	XXXX
Required production	XXXX



Note that production requirements are influenced by the desired level of the ending inventory. Inventories should be carefully planned. Excessive inventories tie up funds and create storage problems. Insufficient inventories can lead to lost sales or last-minute, high-cost production efforts. At Hampton Freeze, management believes that an ending inventory equal to 20% of the next quarter's sales strikes the appropriate balance.

Schedule 2 contains the production budget for Hampton Freeze. The first row in the production budget contains the budgeted sales, which have been taken directly from the sales budget (Schedule 1). The total needs for the first quarter are determined by adding together the budgeted sales of 10,000 cases for the quarter and the desired ending inventory of 6,000 cases. As discussed above, the ending inventory is intended to provide some cushion in the event that problems develop in production or sales increase unexpectedly. Because the budgeted sales for the second quarter are 30,000 cases and management would like the ending inventory in each quarter to equal 20% of the following quarter's sales,

SCHEDULE 2

Hampton Freeze, Inc. Production Budget For the Year Ended December 31, 2008 (in cases)					
	Quarter				Assumed
	1	2	3	4	Year
Budgeted sales (Schedule 1)	10,000	30,000	40,000	20,000	100,000
Add desired ending inventory of finished goods*	6,000	8,000	4,000	3,000	3,000
Total needs	16,000	38,000	44,000	23,000	103,000
Less beginning inventory of finished goods†	2,000	6,000	8,000	4,000	2,000
Required production	14,000	32,000	36,000	19,000	101,000

*Twenty percent of the next quarter's sales. The ending inventory of 3,000 cases is assumed.

†The beginning inventory in each quarter is the same as the prior quarter's ending inventory.

the desired ending inventory for the first quarter is 6,000 cases (20% of 30,000 cases). Consequently, the total needs for the first quarter are 16,000 cases. However, because the company already has 2,000 cases in beginning inventory, only 14,000 cases need to be produced in the first quarter.

Pay particular attention to the Year column to the right of the production budget in Schedule 2. In some cases (e.g., budgeted sales, total needs, and required production), the amount listed for the year is the sum of the quarterly amounts for the item. In other cases (e.g., desired ending inventory of finished goods and beginning inventory of finished goods), the amount listed for the year is not simply the sum of the quarterly amounts. From the standpoint of the entire year, the beginning finished goods inventory is the same as the beginning finished goods inventory for the first quarter—it is *not* the sum of the beginning finished goods inventories for all quarters. Similarly, from the standpoint of the entire year, the ending finished goods inventory is the same as the ending finished goods inventory for the fourth quarter—it is *not* the sum of the ending finished goods inventories for all four quarters. It is important to pay attention to such distinctions in all of the schedules that follow.

Inventory Purchases—Merchandising Company

Hampton Freeze prepares a production budget because it is a *manufacturing* company. If it were a *merchandising* company, instead it would prepare a **merchandise purchases budget** showing the amount of goods to be purchased from suppliers during the period. The merchandise purchases budget has the same basic format as the production budget, as shown below:

Budgeted sales	XXXXX
Add desired ending merchandise inventory	<u>XXXXX</u>
Total needs	XXXXX
Less beginning merchandise inventory	<u>XXXXX</u>
Required purchases	<u>XXXXX</u>

A merchandising company would prepare a merchandise purchases budget such as the one above for each item carried in stock. The merchandise purchases budget can be expressed in terms of either units or the purchase cost of those units.

The Direct Materials Budget

A *direct materials budget* is prepared after the production requirements have been computed. The **direct materials budget** details the raw materials that must be purchased to fulfill the production budget and to provide for adequate inventories. The required purchases of raw materials are computed as follows:

Raw materials needed to meet the production schedule	XXXXX
Add desired ending inventory of raw materials.....	<u>XXXXX</u>
Total raw materials needs	XXXXX
Less beginning inventory of raw materials	<u>XXXXX</u>
Raw materials to be purchased.....	<u>XXXXX</u>

Schedule 3 contains the direct materials budget for Hampton Freeze. The only raw material included in that budget is high fructose sugar, which is the major ingredient in popsicles other than water. The remaining raw materials are relatively insignificant and are included in variable manufacturing overhead. As with finished goods, management would like to maintain some inventories of raw materials to act as a cushion. In this case, management would like to maintain ending inventories of sugar equal to 10% of the following quarter's production needs.

LEARNING OBJECTIVE 4

Prepare a direct materials budget, including a schedule of expected cash disbursements for purchases of materials.



SCHEDULE 3

Hampton Freeze, Inc. Direct Materials Budget For the Year Ended December 31, 2008					
	Quarter				Year
	1	2	3	4	
Required production in cases (Schedule 2)	14,000	32,000	36,000	19,000	101,000
Raw materials needed per case (pounds)	15	15	15	15	15
Production needs (pounds)	210,000	480,000	540,000	285,000	1,515,000
Add desired ending inventory of raw materials ¹	48,000	54,000	28,500	22,500	22,500
Total needs	258,000	534,000	568,500	307,500	1,537,500
Less beginning inventory of raw materials	21,000	48,000	54,000	28,500	21,000
Raw materials to be purchased	237,000	486,000	514,500	279,000	1,516,500
Cost of raw materials per pound	\$ 0.20	\$ 0.20	\$ 0.20	\$ 0.20	\$ 0.20
Cost of raw materials to be purchased	\$ 47,400	\$ 97,200	\$ 102,900	\$ 55,800	\$ 303,300
Percentage of purchases paid for in the period of the purchase			50%		
Percentage of purchases paid for in the period after purchase			50%		
Schedule of Expected Cash Disbursements for Materials					
Accounts payable, beginning balance ²	\$ 25,800				\$ 25,800
First-quarter purchases ³	23,700	\$ 23,700			47,400
Second-quarter purchases ⁴		48,600	\$ 48,600		97,200
Third-quarter purchases ⁵			51,450	\$ 51,450	102,900
Fourth-quarter purchases ⁶				27,900	27,900
Total cash disbursements for materials	\$ 49,500	\$ 72,300	\$ 100,050	\$ 79,350	\$ 301,200

¹Ten percent of the next quarter's production needs. For example, the second-quarter production needs are 480,000 pounds. Therefore, the desired ending inventory for the first quarter would be $10\% \times 480,000$ pounds = 48,000 pounds. The ending inventory of 22,500 pounds for the fourth quarter is assumed.

²Cash payments for last year's fourth-quarter material purchases. See the beginning-of-year balance sheet on page 332.

³ $\$47,400 \times 50\%$; $\$47,400 \times 50\%$.

⁴ $\$97,200 \times 50\%$; $\$97,200 \times 50\%$.

⁵ $\$102,900 \times 50\%$; $\$102,900 \times 50\%$.

⁶ $\$55,800 \times 50\%$. Unpaid fourth-quarter purchases appear as accounts payable on the company's end-of-year balance sheet.

The first line in the direct materials budget contains the required production for each quarter, which is taken directly from the production budget (Schedule 2). Looking at the first quarter, because the production schedule calls for production of 14,000 cases of popsicles and each case requires 15 pounds of sugar, the total production needs are 210,000 pounds of sugar (14,000 cases \times 15 pounds per case). In addition, management

wants to have ending inventories of 48,000 pounds of sugar, which is 10% of the following quarter's needs of 480,000 pounds. Consequently, the total needs are 258,000 pounds (210,000 pounds for the current quarter's production plus 48,000 pounds for the desired ending inventory). However, because the company already has 21,000 pounds in beginning inventory, only 237,000 pounds of sugar (258,000 pounds – 21,000 pounds) will need to be purchased. Finally, the cost of the raw materials purchases is determined by multiplying the amount of raw material to be purchased by its unit cost. In this case, because 237,000 pounds of sugar will need to be purchased during the first quarter and sugar costs \$0.20 per pound, the total cost will be \$47,400 (237,000 pounds × \$0.20 per pound).

As with the production budget, the amounts listed under the Year column are not always the sum of the quarterly amounts. The desired ending raw materials inventory for the year is the same as the desired ending raw materials inventory for the fourth quarter. Likewise, the beginning raw materials inventory for the year is the same as the beginning raw materials inventory for the first quarter.

The direct materials budget (or the merchandise purchases budget for a merchandising company) is usually accompanied by a schedule of expected cash disbursements for raw materials (or merchandise purchases). This schedule is needed to prepare the overall cash budget. Disbursements for raw materials (or merchandise purchases) consist of payments for purchases on account in prior periods plus any payments for purchases in the current budget period. Schedule 3 contains such a schedule of cash disbursements for Hampton Freeze.

Ordinarily, companies do not immediately pay their suppliers. At Hampton Freeze, the policy is to pay for 50% of purchases in the quarter in which the purchase is made and 50% in the following quarter, so while the company intends to purchase \$47,400 worth of sugar in the first quarter, the company will only pay for half, \$23,700, in the first quarter and the other half will be paid in the second quarter. The company will also pay \$25,800 in the first quarter for sugar that was purchased on account in the previous quarter, but not yet paid for. This is the beginning balance in the accounts payable. Therefore, the total cash disbursements for sugar in the first quarter are \$49,500—the \$25,800 payment for sugar acquired in the previous quarter plus the \$23,700 payment for sugar acquired during the first quarter.

CONCEPT CHECK

- If a company has a beginning merchandise inventory of \$50,000, a desired ending merchandise inventory of \$30,000, and a budgeted cost of goods sold of \$300,000, what is the amount of required inventory purchases?
 - \$320,000
 - \$280,000
 - \$380,000
 - \$300,000
- Budgeted unit sales for March, April, and May are 75,000, 80,000, and 90,000 units. Management desires to maintain an ending inventory equal to 30% of the next month's unit sales. How many units should be produced in April?
 - 80,000 units
 - 83,000 units
 - 77,000 units
 - 85,000 units

LEARNING OBJECTIVE 5

Prepare a direct labor budget.



The Direct Labor Budget

The **direct labor budget** shows the direct labor-hours required to satisfy the production budget. By knowing in advance how much labor time will be needed throughout the budget year, the company can develop plans to adjust the labor force as the situation requires. Companies that neglect to budget run the risk of facing labor shortages or having to hire and lay off workers at awkward times. Erratic labor policies lead to insecurity, low morale, and inefficiency.

The direct labor budget for Hampton Freeze is shown in Schedule 4. The first line in the direct labor budget consists of the required production for each quarter, which is taken directly from the production budget (Schedule 2). The direct labor requirement for each

SCHEDULE 4

Hampton Freeze, Inc. Direct Labor Budget For the Year Ended December 31, 2008					
	Quarter				Year
	1	2	3	4	
Required production in cases (Schedule 2)	14,000	32,000	36,000	19,000	101,000
Direct labor-hours per case	0.40	0.40	0.40	0.40	0.40
Total direct labor-hours needed	5,600	12,800	14,400	7,600	40,400
Direct labor cost per hour	\$ 15.00	\$ 15.00	\$ 15.00	\$ 15.00	\$ 15.00
Total direct labor cost*	\$ 84,000	\$ 192,000	\$ 216,000	\$ 114,000	\$ 606,000

*This schedule assumes that the direct labor workforce will be fully adjusted to the total direct labor-hours needed each quarter.

quarter is computed by multiplying the number of units to be produced in that quarter by the number of direct labor-hours required to make a unit. For example, 14,000 cases are to be produced in the first quarter and each case requires 0.40 direct labor-hour, so a total of 5,600 direct labor-hours (14,000 cases \times 0.40 direct labor-hour per case) will be required in the first quarter. The direct labor requirements can then be translated into budgeted direct labor costs. How this is done will depend on the company's labor policy. In Schedule 4, Hampton Freeze has assumed that the direct labor force will be adjusted as the work requirements change from quarter to quarter. In that case, the direct labor cost is computed by simply multiplying the direct labor-hour requirements by the direct labor rate per hour. For example, the direct labor cost in the first quarter is \$84,000 (5,600 direct labor-hours \times \$15 per direct labor-hour).

However, many companies have employment policies or contracts that prevent them from laying off and rehiring workers as needed. Suppose, for example, that Hampton Freeze has 25 workers who are classified as direct labor, but each of them is guaranteed at least 480 hours of pay each quarter at a rate of \$15 per hour. In that case, the minimum direct labor cost for a quarter would be as follows:

$$25 \text{ workers} \times 480 \text{ hours per worker} \times \$15 \text{ per hour} = \$180,000$$

Note that in this case the direct labor costs for the first and fourth quarters would have to be increased to \$180,000.

The Manufacturing Overhead Budget

The **manufacturing overhead budget** lists all costs of production other than direct materials and direct labor. Schedule 5 shows the manufacturing overhead budget for Hampton Freeze. At Hampton Freeze, manufacturing overhead is separated into variable and fixed components. The variable component is \$4 per direct labor-hour and the fixed

LEARNING OBJECTIVE 6

Prepare a manufacturing overhead budget.

SCHEDULE 5

Hampton Freeze, Inc. Manufacturing Overhead Budget For the Year Ended December 31, 2008					
	Quarter				Year
	1	2	3	4	
Budgeted direct labor-hours (Schedule 4)	5,600	12,800	14,400	7,600	40,400
Variable manufacturing overhead rate	\$ 4.00	\$ 4.00	\$ 4.00	\$ 4.00	\$ 4.00
Variable manufacturing overhead	\$ 22,400	\$ 51,200	\$ 57,600	\$ 30,400	\$ 161,600
Fixed manufacturing overhead	60,600	60,600	60,600	60,600	242,400
Total manufacturing overhead	83,000	111,800	118,200	91,000	404,000
Less depreciation	15,000	15,000	15,000	15,000	60,000
Cash disbursements for manufacturing overhead	\$ 68,000	\$ 96,800	\$ 103,200	\$ 76,000	\$ 344,000
Total manufacturing overhead (a)					\$ 404,000
Budgeted direct labor-hours (b)					40,400
Predetermined overhead rate for the year (a)÷(b)					\$ 10.00



component is \$60,600 per quarter. Because the variable component of manufacturing overhead depends on direct labor, the first line in the manufacturing overhead budget consists of the budgeted direct labor-hours from the direct labor budget (Schedule 4). The budgeted direct labor-hours in each quarter are multiplied by the variable rate to determine the variable component of manufacturing overhead. For example, the variable manufacturing overhead for the first quarter is \$22,400 (5,600 direct labor-hours × \$4.00 per direct labor-hour). This is added to the fixed manufacturing overhead for the quarter to determine the total manufacturing overhead for the quarter of \$83,000 (\$22,400 + \$60,600).

A few words about fixed costs and the budgeting process are in order. In most cases, fixed costs are the costs of supplying capacity to make products, process purchase orders, handle customer calls, and so on. The amount of capacity that will be required depends on the expected level of activity for the period. If the expected level of activity is greater than the company's current capacity, then fixed costs may have to be increased. Or, if the expected level is appreciably below the company's current capacity, then it may be desirable to decrease fixed costs if possible. However, once the level of the fixed costs has been determined in the budget, the costs really are fixed. The time to adjust fixed costs is during the budgeting process. An activity-based costing system can help to determine the appropriate level of fixed costs at budget time by answering questions like, "How many clerks will we need to process the anticipated number of purchase orders next year?" For simplicity, in all of the budgeting examples in this book assume that the appropriate levels of fixed costs have already been determined.

The last line of Schedule 5 for Hampton Freeze shows the budgeted cash disbursements for manufacturing overhead. Because some of the overhead costs are not cash outflows, the total budgeted manufacturing overhead costs must be adjusted to

determine the cash disbursements for manufacturing overhead. At Hampton Freeze, the only significant noncash manufacturing overhead cost is depreciation, which is \$15,000 per quarter. These noncash depreciation charges are deducted from the total budgeted manufacturing overhead to determine the expected cash disbursements. Hampton Freeze pays all overhead costs involving cash disbursements in the quarter incurred. Note that the company's predetermined overhead rate for the year is \$10 per direct labor-hour, which is determined by dividing the total budgeted manufacturing overhead for the year by the total budgeted direct labor-hours for the year.

The Ending Finished Goods Inventory Budget

After completing Schedules 1–5, Larry Giano had all of the data he needed to compute unit product costs. This computation was needed for two reasons: first, to determine cost of goods sold on the budgeted income statement; and second, to value ending inventories. The cost of unsold units is computed on the **ending finished goods inventory budget**.

Larry Giano considered using variable costing to prepare Hampton Freeze's budget statements, but he decided to use absorption costing instead because the bank would very likely require absorption costing. He also knew that it would be easy to convert the absorption costing financial statements to a variable costing basis later. At this point, the primary concern was to determine what financing, if any, would be required in 2008 and then to arrange for that financing from the bank.

The unit product cost computations are shown in Schedule 6. For Hampton Freeze, the absorption costing unit product cost is \$13 per case of popsicles---consisting of \$3 of

SCHEDULE 6

Hampton Freeze, Inc.						
Ending Finished Goods Inventory Budget						
(absorption costing basis)						
For the Year Ended December 31, 2008						
Item	Quantity	Cost	Total			
Production cost per case:						
Direct materials	15.00 pounds	\$ 0.20 per pound	\$	3.00		
Direct labor	0.40 hours	\$ 15.00 per hour		6.00		
Manufacturing overhead	0.40 hours	\$ 10.00 per hour		4.00		
Unit product cost				\$	13.00	
Budgeted finished goods inventory:						
Ending finished goods inventory in cases (Schedule 2)					3,000	
Unit product cost (see above)				\$	13.00	
Ending finished goods inventory in dollars				\$	39,000	

direct materials, \$6 of direct labor, and \$4 of manufacturing overhead. The manufacturing overhead is applied to units of product at the rate of \$10 per direct labor-hour. The budgeted carrying cost of the ending inventory is \$39,000.

The Selling and Administrative Expense Budget

LEARNING OBJECTIVE 7

Prepare a selling and administrative expense budget.



The **selling and administrative expense budget** lists the budgeted expenses for areas other than manufacturing. In large organizations, this budget would be a compilation of many smaller, individual budgets submitted by department heads and other persons responsible for selling and administrative expenses. For example, the marketing manager would submit a budget detailing the advertising expenses for each budget period.

Schedule 7 contains the selling and administrative expense budget for Hampton Freeze. Like the manufacturing overhead budget, the selling and administrative expense budget is divided into variable and fixed cost components. In the case of Hampton Freeze, the variable selling and administrative expense is \$1.80 per case. Consequently, budgeted sales in cases for each quarter are entered at the top of the schedule. These data are taken from the sales budget (Schedule 1). The budgeted variable selling and administrative expenses are determined by multiplying the budgeted cases sold by the variable selling and administrative expense per case. For example, the budgeted variable selling and administrative expense for the first quarter is \$18,000 (10,000 cases × \$1.80 per case). The fixed selling and administrative expenses (all given data) are then

SCHEDULE 7

Hampton Freeze, Inc.					
Selling and Administrative Expense Budget					
For the Year Ended December 31, 2008					
	Quarter				Year
	1	2	3	4	
Budgeted sales in cases (Schedule 1)	10,000	30,000	40,000	20,000	100,000
Variable selling and administrative expense per case	\$ 1.80	\$ 1.80	\$ 1.80	\$ 1.80	\$ 1.80
Variable selling and administrative expense	\$ 18,000	\$ 54,000	\$ 72,000	\$ 36,000	\$180,000
Fixed selling and administrative expenses:					
Advertising	20,000	20,000	20,000	20,000	80,000
Executive salaries	55,000	55,000	55,000	55,000	220,000
Insurance	10,000	10,000	10,000	10,000	40,000
Property taxes	4,000	4,000	4,000	4,000	16,000
Depreciation	10,000	10,000	10,000	10,000	40,000
Total fixed selling and administrative expenses	99,000	99,000	99,000	99,000	396,000
Total selling and administrative expenses	117,000	153,000	171,000	135,000	576,000
Less depreciation	10,000	10,000	10,000	10,000	40,000
Cash disbursements for selling and administrative expenses	\$107,000	\$143,000	\$161,000	\$125,000	\$536,000

added to the variable selling and administrative expenses to arrive at the total budgeted selling and administrative expenses. Finally, to determine the cash disbursements for selling and administrative items, the total budgeted selling and administrative expense is adjusted by subtracting any noncash selling and administrative expenses (in this case, just depreciation).¹

Budget Analyst

YOU DECIDE

You have been hired as a budget analyst by a regional chain of Italian restaurants with attached bars. Management has had difficulty in the past predicting some of its costs; the assumption has always been that all operating costs are variable with respect to gross restaurant sales. What would you suggest doing to improve the accuracy of the budget forecasts?

Canon Invests In Research and Development

IN BUSINESS

When **Canon Inc.**, the world's leading digital camera manufacturer, prepares the research and development (R&D) portion of its selling and administrative expense budget, the focus is on making long-run investments to grow sales rather than cutting costs to maximize short-run profits. In 2005, Canon spent 8% of its sales on R&D while many of its competitors spent 6% to 7.5% of their sales on R&D. Canon's CEO Fujio Mitarai described his company's R&D philosophy by saying "we have to plant the seeds for the next decade and beyond." Indeed, Canon's seeds have blossomed as the company has secured more than 17,000 patents since 1995—second only to **IBM**. Canon's commitment to R&D helps explain why its digital cameras are delivering healthy earnings at a time when many of its competitors are losing money.

Source: Ian Rowley, Hiroko Tashiro, and Louise Lee, "Canon: Combat-Ready," *BusinessWeek*, September 5, 2005, pp. 48-49.



The Cash Budget

As illustrated in Exhibit 7-2, the cash budget combines much of the data developed in the preceding steps. It is a good idea to review Exhibit 7-2 to get the big picture firmly in your mind before moving on.

The cash budget is composed of four major sections:

1. The receipts section.
2. The disbursements section.
3. The cash excess or deficiency section.
4. The financing section.

The receipts section lists all of the cash inflows, except from financing, expected during the budget period. Generally, the major source of receipts is from sales.

LEARNING OBJECTIVE 8

Prepare a cash budget.



¹Other adjustments might need to be made for differences between cash flows on the one hand and revenues and expenses on the other hand. For example, if property taxes are paid twice a year in installments of \$8,000 each, the expense for property tax would have to be "backed out" of the total budgeted selling and administrative expenses and the cash installment payments added to the appropriate quarters to determine the cash disbursements. Similar adjustments might also need to be made in the manufacturing overhead budget. We generally ignore these complications in this chapter.

IN BUSINESS

Concentrating on the Cash Flow



Burlington Northern Santa Fe (BNSF) operates the second largest railroad in the United States. The company's senior vice president, CFO, and treasurer is Tom Hunt, who reports that "As a general theme, we've become very cash-flow-oriented." After the merger of the Burlington Northern and Santa Fe railroads, the company went through a number of years of heavy investments and negative cash flows. To keep on top of the company's cash position, Hunt has a cash forecast prepared every month. "Everything falls like dominoes from free cash flow," Hunt says. "It provides us with alternatives. Right now, the alternative of choice is buying back our own stock . . . [b]ut it could be increasing dividends or making acquisitions. All those things are not even on the radar screen if you don't have free cash flow."

Source: Randy Myers, "Cash Crop: The 2000 Working Capital Survey," *CFO*, August 2000, pp. 59–82.

The disbursements section summarizes all cash payments that are planned for the budget period. These payments include raw materials purchases, direct labor payments, manufacturing overhead costs, and so on, as contained in their respective budgets. In addition, other cash disbursements such as equipment purchases and dividends are listed.

The cash excess or deficiency section is computed as follows:

Cash balance, beginning	XXXX
Add receipts	XXXX
Total cash available	XXXX
Less disbursements.....	XXXX
Excess (deficiency) of cash available over disbursements	XXXX

If a cash deficiency exists during any budget period, the company will need to borrow funds. If there is a cash excess during any budget period, funds borrowed in previous periods can be repaid or the excess funds can be invested.

The financing section details the borrowings and repayments projected to take place during the budget period. It also lists interest payments that will be due on money borrowed.²

The cash balances at both the beginning and end of the year may be adequate even though a serious cash deficit occurs at some point during the year. Consequently, the cash budget should be broken down into time periods that are short enough to capture major fluctuations in cash balances. While a monthly cash budget is most common, some organizations budget cash on a weekly or even daily basis. Larry Giano has prepared a quarterly cash budget for Hampton Freeze that can be further refined as necessary. This budget appears in Schedule 8. The cash budget builds on the earlier schedules and on additional data that are provided below:

- The beginning cash balance is \$42,500.
- Management plans to spend \$130,000 during the year on equipment purchases: \$50,000 in the first quarter; \$40,000 in the second quarter; \$20,000 in the third quarter; and \$20,000 in the fourth quarter.

²The format for the statement of cash flows, which is discussed in a later chapter, may also be used for the cash budget.

SCHEDULE 8

Hampton Freeze, Inc. Cash Budget For the Year Ended December 31, 2008						
	Schedule	Quarter				Year
		1	2	3	4	
Cash balance, beginning		\$42,500	\$36,000	\$33,900	\$165,650	\$42,500
Add receipts:						
Collections from customers	1	230,000	480,000	740,000	520,000	1,970,000
Total cash available		272,500	516,000	773,900	685,650	2,012,500
Less disbursements:						
Direct materials	3	49,500	72,300	100,050	79,350	301,200
Direct labor	4	84,000	192,000	216,000	114,000	606,000
Manufacturing overhead	5	68,000	96,800	103,200	76,000	344,000
Selling and administrative	7	107,000	143,000	161,000	125,000	536,000
Equipment purchases		50,000	40,000	20,000	20,000	130,000
Dividends		8,000	8,000	8,000	8,000	32,000
Total disbursements		366,500	552,100	608,250	422,350	1,949,200
Excess (deficiency) of cash available over disbursements		(94,000)	(36,100)	165,650	263,300	63,300
Financing:						
Borrowings (at the beginnings of quarters)		130,000	70,000	-	-	200,000
Repayments (at end of the year)		-	-	-	(200,000)	(200,000)
Interest		-	-	-	(21,900)	(21,900)
Total financing		130,000	70,000	-	(221,900)	(21,900)
Cash balance, ending		\$36,000	\$33,900	\$165,650	\$41,400	\$41,400

- The board of directors has approved cash dividends of \$8,000 per quarter.
- Management would like to have a cash balance of at least \$30,000 at the beginning of each quarter for contingencies.
- Hampton Freeze has an agreement with a local bank that allows the company to borrow in increments of \$10,000 at the beginning of each quarter, up to a total loan balance of \$250,000. The interest rate on these loans is 1% per month and for simplicity we will assume that interest is not compounded. The company would, as far as it is able, repay the loan plus accumulated interest at the end of the year.

The cash budget is prepared one quarter at a time, starting with the first quarter. Larry began the cash budget by entering the beginning balance of cash for the first quarter of \$42,500—a number that is given above. Receipts—in this case, just the \$230,000 in cash collections from customers—are added to the beginning balance to arrive at the total cash available of \$272,500. Because the total disbursements are \$366,500 and the total cash available is only \$272,500, there is a shortfall of \$94,000. Because management

would like to have a beginning cash balance of at least \$30,000 for the second quarter, the company will need to borrow at least \$124,000.

Required Borrowings at the Beginning of the First Quarter

Desired ending cash balance	\$ 30,000
Plus deficiency of cash available over disbursements	<u>94,000</u>
Minimum required borrowings	<u>\$124,000</u>

Recall that the bank requires that loans be made in increments of \$10,000. Because Hampton Freeze needs to borrow at least \$124,000, it will have to borrow \$130,000.

The second quarter of the cash budget is handled similarly. Note that the ending cash balance for the first quarter is brought forward as the beginning cash balance for the second quarter. Also note that additional borrowing is required in the second quarter because of the continued cash shortfall.

Required Borrowings at the Beginning of the Second Quarter

Desired ending cash balance	\$ 30,000
Plus deficiency of cash available over disbursements	<u>36,100</u>
Minimum required borrowings	<u>\$ 66,100</u>

Again, recall that the bank requires that loans be made in increments of \$10,000. Because Hampton Freeze needs to borrow at least \$66,100 at the beginning of the second quarter, the company will have to borrow \$70,000 from the bank.

In the third quarter, the cash flow situation improves dramatically and the excess of cash available over disbursements is \$165,650. Therefore, the company will end the quarter with ample cash and no further borrowing is necessary.

At the end of the fourth quarter, the loan and accumulated interest must be repaid. The accumulated interest can be computed as follows:

Interest on \$130,000 borrowed at the beginning of the first quarter:	
\$130,000 × 0.01 per month × 12 months*	\$15,600
Interest on \$70,000 borrowed at the beginning of the second quarter:	
\$70,000 × 0.01 per month × 9 months*	<u>6,300</u>
Total interest accrued to the end of the fourth quarter	<u>\$21,900</u>

*Simple, rather than compounded, interest is assumed for simplicity.

Note that the loan repayment of \$200,000 (\$130,000 + \$70,000) appears in the financing section for the fourth quarter along with the interest payment of \$21,900 computed above.

As with the production and raw materials budgets, the amounts under the Year column in the cash budget are not always the sum of the amounts for the four quarters. In particular, the beginning cash balance for the year is the same as the beginning cash balance for the first quarter and the ending cash balance for the year is the same as the ending cash balance for the fourth quarter. Also note the beginning cash balance in any quarter is the same as the ending cash balance for the previous quarter.

Cash Crisis at a Start-Up Company

IN BUSINESS

Good Home Co., headquartered in New York City, sells home cleaning and laundry products through merchandisers such as **Restoration Hardware** and **Nordstrom**. In 2001, the company's sales were \$2.1 million. Then in September 2002, the company's founder Christine Dimmick appeared on the cable shopping network QVC and in a few hours she sold more than \$300,000 worth of merchandise. However, euphoria turned to panic when Christine realized that she needed \$200,000 in short-term financing to fill those orders. When attempts to renegotiate payment terms with suppliers failed, Christine realized that she needed to hire a finance professional. Jerry Charlup, who was hired as Good Home's part-time CFO, spent \$6,000 to create a cash flow forecasting system using Excel. As Good Home's annual sales have grown to \$4 million, Charlup says the new forecasting system is giving the company "a far clearer fix on how much operating capital it needs at any given time."

Source: Susan Hansen, "The Rent-To-Own CFO Program," *Inc.* magazine, February 2004, pp. 28–29.

The Budgeted Income Statement

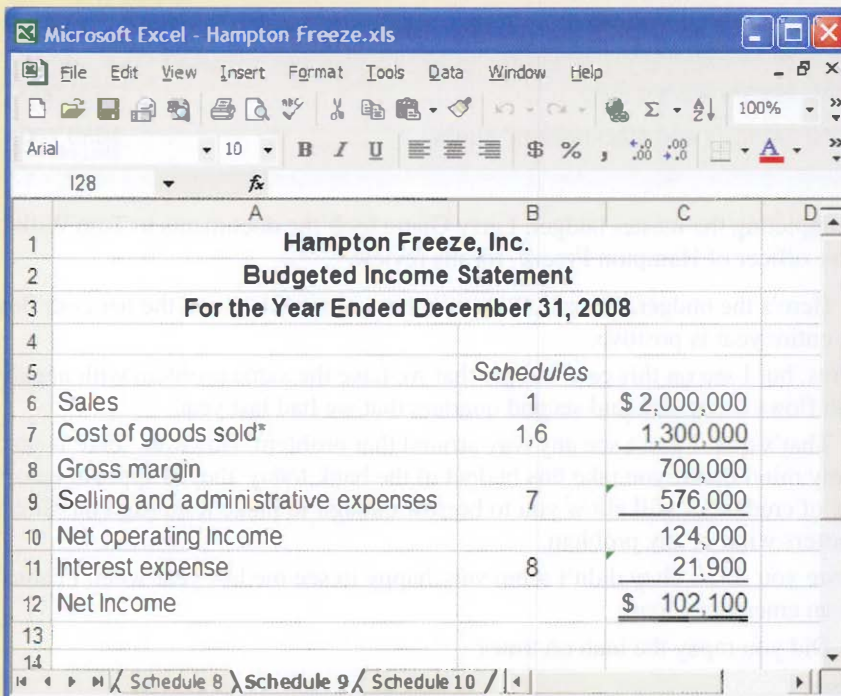
A budgeted income statement can be prepared from the data developed in Schedules 1–8. *The budgeted income statement is one of the key schedules in the budget process.* It shows the company's planned profit and serves as a benchmark against which subsequent company performance can be measured.

Schedule 9 contains the budgeted income statement for Hampton Freeze.

LEARNING OBJECTIVE 9

Prepare a budgeted income statement.

SCHEDULE 9



Hampton Freeze, Inc.			
Budgeted Income Statement			
For the Year Ended December 31, 2008			
	<i>Schedules</i>		
6	Sales	1	\$ 2,000,000
7	Cost of goods sold*	1,6	<u>1,300,000</u>
8	Gross margin		700,000
9	Selling and administrative expenses	7	<u>576,000</u>
10	Net operating income		124,000
11	Interest expense	8	<u>21,900</u>
12	Net Income		<u>\$ 102,100</u>

*100,000 cases sold × \$13 per case = \$1,300,000.



The Budgeted Balance Sheet

LEARNING OBJECTIVE 10

Prepare a budgeted balance sheet.



The budgeted balance sheet is developed using data from the balance sheet from the beginning of the budget period and data contained in the various schedules. Hampton Freeze's budgeted balance sheet is presented in Schedule 10. Some of the data on the budgeted balance sheet have been taken from the company's previous end-of-year balance sheet for 2007 which appears below:

Hampton Freeze, Inc.		
Balance Sheet		
December 31, 2007		
Assets		
Current assets:		
Cash	\$ 42,500	
Accounts receivable	90,000	
Raw materials inventory (21,000 pounds)	4,200	
Finished goods inventory (2,000 cases)	<u>26,000</u>	
Total current assets		\$162,700
Plant and equipment:		
Land	80,000	
Buildings and equipment	700,000	
Accumulated depreciation	<u>(292,000)</u>	
Plant and equipment, net		<u>488,000</u>
Total assets		<u>\$650,700</u>
Liabilities and Stockholders' Equity		
Current liabilities:		
Accounts payable (raw materials)		\$ 25,800
Stockholders' equity:		
Common stock, no par	\$175,000	
Retained earnings	<u>449,900</u>	
Total stockholders' equity		<u>624,900</u>
Total liabilities and stockholders' equity		<u>\$650,700</u>

After completing the master budget, Larry Giano took the documents to Tom Wills, chief executive officer of Hampton Freeze, for his review.

Larry: Here's the budget. Overall, the net income is excellent, and the net cash flow for the entire year is positive.

Tom: Yes, but I see on this cash budget that we have the same problem with negative cash flows in the first and second quarters that we had last year.

Larry: That's true. I don't see any way around that problem. However, there is no doubt in my mind that if you take this budget to the bank today, they'll approve an open line of credit that will allow you to borrow enough to make it through the first two quarters without any problem.

Tom: Are you sure? They didn't seem very happy to see me last year when I came in for an emergency loan.

Larry: Did you repay the loan on time?

Tom: Sure.

Larry: I don't see any problem. You won't be asking for an emergency loan this time. The bank will have plenty of warning. And with this budget, you have a solid plan that shows when and how you are going to pay off the loan. Trust me, they'll go for it.

MANAGERIAL ACCOUNTING IN ACTION

The Wrap Up



SCHEDULE 10

	A	B	C	D	E
Hampton Freeze, Inc.					
Budgeted Balance Sheet					
December 31, 2008					
Assets					
Current assets:					
Cash		\$ 41,400	(a)		
Accounts receivable		120,000	(b)		
Raw materials inventory		4,500	(c)		
Finished goods inventory		<u>39,000</u>	(d)		
Total current assets				\$ 204,900	
Plant and equipment:					
Land		80,000	(e)		
Buildings and equipment		830,000	(f)		
Accumulated depreciation		<u>(392,000)</u>	(g)		
Plant and equipment, net				<u>518,000</u>	
Total assets				<u>\$ 722,900</u>	
Liabilities and Stockholders' Equity					
Current liabilities:					
Accounts payable (raw materials)				\$ 27,900	(h)
Stockholders' equity:					
Common stock, no par		\$ 175,000	(i)		
Retained earnings		<u>520,000</u>	(j)		
Total stockholders' equity				<u>695,000</u>	
Total liabilities and stockholders' equity				<u>\$ 722,900</u>	

Explanation of December 31, 2008, balance sheet figures:

- (a) The ending cash balance, as projected by the cash budget in Schedule 8.
- (b) Thirty percent of fourth-quarter sales, from Schedule 1 ($\$400,000 \times 30\% = \$120,000$).
- (c) From Schedule 3, the ending raw materials inventory will be 22,500 pounds. This material costs \$0.20 per pound. Therefore, the ending inventory in dollars will be 22,500 pounds \times \$0.20 per pound = \$4,500.
- (d) From Schedule 6.
- (e) From the December 31, 2007, balance sheet (no change).
- (f) The December 31, 2007, balance sheet indicated a balance of \$700,000. During 2008, \$130,000 of additional equipment will be purchased (see Schedule 8), bringing the December 31, 2008, balance to \$830,000.
- (g) The December 31, 2007, balance sheet indicated a balance of \$292,000. During 2008, \$100,000 of depreciation will be taken (\$60,000 on Schedule 5 and \$40,000 on Schedule 7), bringing the December 31, 2008, balance to \$392,000.
- (h) One-half of the fourth-quarter raw materials purchases, from Schedule 3.
- (i) From the December 31, 2007, balance sheet (no change).

(j)	December 31, 2007, balance	\$449,900
	Add net income, from Schedule 9	<u>102,100</u>
		552,000
	Deduct dividends paid, from Schedule 8	<u>32,000</u>
	December 31, 2008, balance	<u>\$520,000</u>

DECISION MAKER

Bank Manager

You are the manager of a branch of a state bank located in a medium-sized community. The owner of a small manufacturing company in the community wants to apply for an unsecured line of credit for the upcoming year. The company has been in business for several years but has experienced seasonal cash shortages as it has grown. What documents would you request from the owner to back up the loan request and what tests would you apply to the documents to ensure that they are realistic?

IN BUSINESS

Moving beyond Excel to the Web

While research shows that two-thirds of U.S. companies still rely on Microsoft Excel for their budgeting process, some companies are evolving to a more technologically advanced approach. For example, **Hendrick Motorsports** has vaulted to the top of the NASCAR racing circuit thanks in part to its new budgeting process. Scott Lampe, Hendrick's CFO, discarded Excel in favor of Forecaster, a web-based budgeting program. He commented "with a spreadsheet, you can build the model the way you want it . . . The problem is, only you understand that model. Then you have to explain it to everyone, one at a time." The web-based approach enables Lampe to involve his crew chiefs, chassis guys, and engine guys in the budgeting process.

The **Facilities & Operations (F&O) Business Office of the Battelle, Pacific Northwest National Laboratory** has over 130 budget activities—each of which requires the preparation of an annual budget. In 2001, F&O replaced its spreadsheet-driven budget with a web-based approach. The new system enables F&O "management and their support staff to directly input their business plan and budget requests, eliminating the need for central business planning and budgeting staff to upload the numerous budget requests and subsequent changes." The web-based budgeting system saves F&O personnel more than 500 hours that were previously spent preparing Excel spreadsheets and uploading data.

Source: John Goff, "In the Fast Lane," *CFO*, December 2004, pp. 53–58; Peter T. Smith, Craig A. Goranson, and Mary F. Astley, "Intranet Budgeting Does the Trick," *Strategic Finance*, May 2003, pp. 30–33.

SUMMARY

LO1 Understand why organizations budget and the processes they use to create budgets.

Organizations budget for a variety of reasons, including to communicate management's plans throughout the organization, to force managers to think about and plan for the future, to allocate resources within the organization, to identify bottlenecks before they occur, to coordinate activities, and to provide benchmarks for evaluating subsequent performance.

Budgets should be developed with the full participation of all managers who will be subject to budgetary controls.

LO2 Prepare a sales budget, including a schedule of expected cash collections.

The sales budget forms the foundation for the master budget. It provides details concerning the anticipated unit and dollar sales.

The schedule of expected cash collections is based on the sales budget, the expected breakdown between cash and credit sales, and the expected pattern of collections on credit sales.

LO3 Prepare a production budget.

The production budget details how many units must be produced each budget period to satisfy expected sales and to provide for adequate levels of finished goods inventories.

LO4 Prepare a direct materials budget, including a schedule of expected cash disbursements for purchases of materials.

The direct materials budget shows the materials that must be purchased each budget period to meet anticipated production requirements and to provide for adequate levels of materials inventories.

Cash disbursements for purchases of materials will depend on the amount of materials purchased in each budget period and the company's policies concerning payments to suppliers for materials bought on credit.

LO5 Prepare a direct labor budget.

The direct labor budget shows the direct labor-hours that are required to meet the production schedule as detailed in the production budget. The direct labor-hour requirements are used to determine the direct labor cost in each budget period.

LO6 Prepare a manufacturing overhead budget.

Manufacturing overhead consists of both variable and fixed manufacturing overhead. The variable manufacturing overhead depends on the number of units produced from the production budget. The variable and fixed manufacturing overhead costs are combined to determine the total manufacturing overhead. Any noncash manufacturing overhead such as depreciation is deducted from the total manufacturing overhead to determine the cash disbursements for manufacturing overhead.

LO7 Prepare a selling and administrative expense budget.

Like manufacturing overhead, selling and administrative expenses consist of both variable and fixed expenses. The variable expenses depend on the number of units sold or some other measure of activity. The variable and fixed expenses are combined to determine the total selling and administrative expense. Any noncash selling and administrative expenses such as depreciation are deducted from the total to determine the cash disbursements for selling and administrative expenses.

LO8 Prepare a cash budget.

The cash budget is a critical piece of the master budget. It permits managers to anticipate and plan for cash shortfalls.

The cash budget is organized into a receipts section, a disbursements section, a cash excess or deficiency section, and a financing section. The cash budget draws on information taken from nearly all of the other budgets and schedules including the schedule of cash collections, the schedule of cash disbursements for purchases of materials, the direct labor budget, the manufacturing overhead budget, and the selling and administrative expense budget.

LO9 Prepare a budgeted income statement.

The budgeted income statement is constructed using data from the sales budget, the ending finished goods inventory budget, the manufacturing overhead budget, the selling and administrative budget, and the cash budget.

LO10 Prepare a budgeted balance sheet.

The budgeted balance sheet is constructed using data from virtually all other parts of the master budget.

GUIDANCE ANSWERS TO DECISION MAKER AND YOU DECIDE

Budget Analyst (p. 326)

Not all costs are variable with respect to gross restaurant sales. For example, assuming no change in the number of restaurant sites, rental costs are probably fixed. To more accurately forecast costs for the budget, costs should be separated into variable and fixed components. Furthermore, more appropriate activity measures should be selected for the variable costs. For example, gross restaurant sales may be divided into food sales and bar sales—each of which could serve as an activity measure for some costs. In addition,

some costs (such as the costs of free dinner rolls) may be variable with respect to the number of diners rather than with respect to food or bar sales. Other activity measures may permit even more accurate cost predictions.

Bank Manager (p. 334)

At minimum, you should request a cash budget with supporting documents including a sales budget, production budget, direct materials budget, direct labor budget, manufacturing overhead budget, selling and administrative expense budget, budgeted income statement, and budgeted balance sheet. You should check that the cash budget provides for repayment of the loan, plus interest, and that it leaves the company with sufficient cash reserves to start the new year. You should also check that assumptions concerning sales growth and fixed and variable costs are consistent with the company's recent experience.



GUIDANCE ANSWERS TO CONCEPT CHECKS

- Choice c.** Cash collections for April are calculated as follows: $(\$100,000 \times 80\% \times 40\%) + (\$120,000 \times 20\%) + (\$120,000 \times 80\% \times 60\%) = \$113,600$.
- Choice a.** The May 31 accounts receivable balance is $\$125,000 \times 80\% \times 40\% = \$40,000$.
- Choice b.** Required inventory purchases are calculated as follows: $\text{Cost of goods sold of } \$300,000 + \text{Ending inventory of } \$30,000 - \text{Beginning inventory of } \$50,000 = \$280,000$.
- Choice b.** $80,000 \text{ units sold in April} + 27,000 \text{ units of desired ending inventory} - 24,000 \text{ units of beginning inventory} = 83,000 \text{ units}$.

REVIEW PROBLEM: BUDGET SCHEDULES

Mynor Corporation manufactures and sells a seasonal product that has peak sales in the third quarter. The following information concerns operations for Year 2—the coming year—and for the first two quarters of Year 3:

- The company's single product sells for \$8 per unit. Budgeted sales in units for the next six quarters are as follows (all sales are on credit):

	Year 2 Quarter				Year 3 Quarter	
	1	2	3	4	1	2
Budgeted unit sales	40,000	60,000	100,000	50,000	70,000	80,000

- Sales are collected in the following pattern: 75% in the quarter the sales are made, and the remaining 25% in the following quarter. On January 1, Year 2, the company's balance sheet showed \$65,000 in accounts receivable, all of which will be collected in the first quarter of the year. Bad debts are negligible and can be ignored.
- The company desires an ending finished goods inventory at the end of each quarter equal to 30% of the budgeted unit sales for the next quarter. On December 31, Year 1, the company had 12,000 units on hand.
- Five pounds of raw materials are required to complete one unit of product. The company requires ending raw materials inventory at the end of each quarter equal to 10% of the following quarter's production needs. On December 31, Year 1, the company had 23,000 pounds of raw materials on hand.
- The raw material costs \$0.80 per pound. Raw material purchases are paid for in the following pattern: 60% paid in the quarter the purchases are made, and the remaining 40% paid in the following quarter. On January 1, Year 2, the company's balance sheet showed \$81,500 in accounts payable for raw material purchases, all of which will be paid for in the first quarter of the year.

Required:

Prepare the following budgets and schedules for the year, showing both quarterly and total figures:

- A sales budget and a schedule of expected cash collections.
- A production budget.
- A direct materials budget and a schedule of expected cash payments for purchases of materials.

Solution to Review Problem

1. The sales budget is prepared as follows:

	Year 2 Quarter				Year
	1	2	3	4	
Budgeted unit sales	40,000	60,000	100,000	50,000	250,000
Selling price per unit	× \$8	× \$8	× \$8	× \$8	× \$8
Total sales	<u>\$320,000</u>	<u>\$480,000</u>	<u>\$800,000</u>	<u>\$400,000</u>	<u>\$2,000,000</u>

Based on the budgeted sales above, the schedule of expected cash collections is prepared as follows:

	Year 2 Quarter				Year
	1	2	3	4	
Accounts receivable, beginning balance	\$ 65,000				\$ 65,000
First-quarter sales (\$320,000 × 75%, 25%)	240,000	\$ 80,000			320,000
Second-quarter sales (\$480,000 × 75%, 25%)		360,000	\$120,000		480,000
Third-quarter sales (\$800,000 × 75%, 25%)			600,000	\$200,000	800,000
Fourth-quarter sales (\$400,000 × 75%)				300,000	300,000
Total cash collections.....	<u>\$305,000</u>	<u>\$440,000</u>	<u>\$720,000</u>	<u>\$500,000</u>	<u>\$1,965,000</u>

2. Based on the sales budget in units, the production budget is prepared as follows:

	Year 2 Quarter				Year 2	Year 3 Quarter	
	1	2	3	4		1	2
Budgeted unit sales	40,000	60,000	100,000	50,000	250,000	70,000	80,000
Add desired ending finished goods inventory* ..	18,000	30,000	15,000	21,000 [†]	21,000	24,000	
Total needs	58,000	90,000	115,000	71,000	271,000	94,000	
Less beginning finished goods inventory	12,000	18,000	30,000	15,000	12,000	21,000	
Required production	<u>46,000</u>	<u>72,000</u>	<u>85,000</u>	<u>56,000</u>	<u>259,000</u>	<u>73,000</u>	

*30% of the following quarter's budgeted sales in units.
[†]30% of the budgeted Year 3 first-quarter sales.

3. Based on the production budget, raw materials will need to be purchased during the year as follows:

	Year 2 Quarter				Year 2	Year 3 Quarter
	1	2	3	4		
Required production (units)	46,000	72,000	85,000	56,000	259,000	73,000
Raw materials needed per unit (pounds)	× 5	× 5	× 5	× 5	× 5	× 5
Production needs (pounds)	230,000	360,000	425,000	280,000	1,295,000	365,000
Add desired ending inventory of raw materials (pounds)*	36,000	42,500	28,000	36,500 [†]	36,500	
Total needs (pounds)	266,000	402,500	453,000	316,500	1,331,500	
Less beginning inventory of raw materials (pounds)	23,000	36,000	42,500	28,000	23,000	
Raw materials to be purchased (pounds)	<u>243,000</u>	<u>366,500</u>	<u>410,500</u>	<u>288,500</u>	<u>1,308,500</u>	

*10% of the following quarter's production needs in pounds.
[†]10% of the Year 3 first-quarter production needs in pounds.

Based on the raw material purchases above, expected cash payments are computed as follows:

	Year 2 Quarter				Year 2
	1	2	3	4	
Cost of raw materials to be purchased at \$0.80 per pound ...	\$194,400	\$293,200	\$328,400	\$230,800	\$1,046,800
Accounts payable, beginning balance	\$ 81,500				\$ 81,500
First-quarter purchases ($\$194,400 \times 60\%$, 40%)	116,640	\$ 77,760			194,400
Second-quarter purchases ($\$293,200 \times 60\%$, 40%)		175,920	\$117,280		293,200
Third-quarter purchases ($\$328,400 \times 60\%$, 40%)			197,040	\$131,360	328,400
Fourth-quarter purchases ($\$230,800 \times 60\%$)				138,480	138,480
Total cash disbursements	\$198,140	\$253,680	\$314,320	\$269,840	\$1,035,980

GLOSSARY

- Budget** A quantitative plan for acquiring and using resources over a specified time period. (p. 308)
- Budget committee** A group of key managers who are responsible for overall budgeting policy and for coordinating the preparation of the budget. (p. 313)
- Cash budget** A detailed plan showing how cash resources will be acquired and used over a specific time period. (p. 314)
- Continuous budget** A 12-month budget that rolls forward one month as the current month is completed. (p. 309)
- Control** Those steps taken by management to increase the likelihood that all parts of the organization are working together to achieve the goals set down at the planning stage. (p. 308)
- Direct labor budget** A detailed plan that shows the direct labor-hours required to fulfill the production budget. (p. 322)
- Direct materials budget** A detailed plan showing the amount of raw materials that must be purchased to fulfill the production budget and to provide for adequate inventories. (p. 320)
- Ending finished goods inventory budget** A budget showing the dollar amount of unsold finished goods inventory that will appear on the ending balance sheet. (p. 325)
- Manufacturing overhead budget** A detailed plan showing the production costs, other than direct materials and direct labor, that will be incurred over a specified time period. (p. 323)
- Master budget** A number of separate but interdependent budgets that formally lay out the company's sales, production, and financial goals and that culminates in a cash budget, budgeted income statement, and budgeted balance sheet. (p. 314)
- Merchandise purchases budget** A detailed plan used by a merchandising company that shows the amount of goods that must be purchased from suppliers during the period. (p. 320)
- Participative budget** See *Self-imposed budget*. (p. 310)
- Perpetual budget** See *Continuous budget*. (p. 309)
- Planning** Developing goals and preparing budgets to achieve those goals. (p. 308)
- Production budget** A detailed plan showing the number of units that must be produced during a period in order to satisfy both sales and inventory needs. (p. 318)
- Responsibility accounting** A system of accountability in which managers are held responsible for those items of revenue and cost—and only those items—over which they can exert significant control. The managers are held responsible for differences between budgeted and actual results. (p. 308)
- Sales budget** A detailed schedule showing expected sales expressed in both dollars and units. (p. 314)
- Self-imposed budget** A method of preparing budgets in which managers prepare their own budgets. These budgets are then reviewed by higher-level managers, and any issues are resolved by mutual agreement. (p. 310)
- Selling and administrative expense budget** A detailed schedule of planned expenses that will be incurred in areas other than manufacturing during a budget period. (p. 326)

QUESTIONS

- 7-1 What is a budget? What is budgetary control?
- 7-2 Discuss some of the major benefits to be gained from budgeting.
- 7-3 What is meant by the term *responsibility accounting*?
- 7-4 What is a master budget? Briefly describe its contents.
- 7-5 Why is the sales forecast the starting point in budgeting?
- 7-6 “As a practical matter, planning and control mean exactly the same thing.” Do you agree? Explain.
- 7-7 Describe the flow of budget data in an organization. Who are the participants in the budgeting process, and how do they participate?
- 7-8 What is a self-imposed budget? What are the major advantages of self-imposed budgets? What caution must be exercised in their use?
- 7-9 How can budgeting assist a company in planning its workforce staffing levels?
- 7-10 “The principal purpose of the cash budget is to see how much cash the company will have in the bank at the end of the year.” Do you agree? Explain.

Multiple-choice questions are provided on the text website at www.mhhe.com/brewer5e.



connect BRIEF EXERCISES

BRIEF EXERCISE 7-1 Budget Process [LO1]

The following terms pertain to the budgeting process:

Benchmarks	Bottlenecks
Budget	Budget committee
Control	Imposed from above
Motivation	Planning
Responsibility accounting	Self-imposed budget

Required:

Fill in the blanks with the most appropriate word or phrase from the above list.

- _____ is generally higher when an individual participates in setting his or her own goals than when the goals are imposed from above.
- If a manager is not able to meet the budget and it has been _____, the manager can always say that the budget was unreasonable or unrealistic to start with, and therefore was impossible to meet.
- A _____ is a detailed plan for acquiring and using financial and other resources over a specified time period.
- _____ involves developing objectives and preparing various budgets to achieve those objectives.
- The budgeting process can uncover potential _____ before they occur.
- _____ involves the steps taken by management to increase the likelihood that the objectives set down at the planning stage are attained.
- Budgets define goals and objectives that can serve as _____ for evaluating subsequent performance.
- In _____, a manager is held accountable for those items, and only those items, over which he or she has significant control.
- A _____ is one that is prepared with the full cooperation and participation of managers at all levels of the organization.
- A _____ is usually responsible for overall policy matters relating to the budget program and for coordinating the preparation of the budget itself.

BRIEF EXERCISE 7-2 Schedule of Expected Cash Collections [LO2]

Silver Company makes a product that is very popular as a Mother's Day gift. Thus, peak sales occur in May of each year, as shown in the company's sales budget for the second quarter given below:

	April	May	June	Total
Budgeted sales (all on account)	\$300,000	\$500,000	\$200,000	\$1,000,000

From past experience, the company has learned that 20% of a month's sales are collected in the month of sale, another 70% are collected in the month following sale, and the remaining 10% are collected in the second month following sale. Bad debts are negligible and can be ignored. February sales totaled \$230,000, and March sales totaled \$260,000.

Required:

1. Prepare a schedule of expected cash collections from sales, by month and in total, for the second quarter.
2. Assume that the company will prepare a budgeted balance sheet as of June 30. Compute the accounts receivable as of that date.

BRIEF EXERCISE 7-3 Production Budget [LO3]

Down Under Products, Ltd., of Australia has budgeted sales of its popular boomerang for the next four months as follows:

	Sales in Units
April	50,000
May	75,000
June	90,000
July	80,000

The company is now in the process of preparing a production budget for the second quarter. Past experience has shown that end-of-month inventory levels must equal 10% of the following month's sales. The inventory at the end of March was 5,000 units.

Required:

Prepare a production budget for the second quarter; in your budget, show the number of units to be produced each month and for the quarter in total.

BRIEF EXERCISE 7-4 Direct Materials Budget [LO4]

Three grams of musk oil are required for each bottle of Mink Caress, a very popular perfume made by a small company in western Siberia. The cost of the musk oil is 150 roubles per kilogram. (Siberia is located in Russia, whose currency is the rouble.) Budgeted production of Mink Caress is given below by quarters for Year 2 and for the first quarter of Year 3:

	Year 2				Year 3
	First	Second	Third	Fourth	First
Budgeted production, in bottles	60,000	90,000	150,000	100,000	70,000

Musk oil has become so popular as a perfume ingredient that it has become necessary to carry large inventories as a precaution against stock-outs. For this reason, the inventory of musk oil at the end of a quarter must be equal to 20% of the following quarter's production needs. Some 36,000 grams of musk oil will be on hand to start the first quarter of Year 2.

Required:

Prepare a direct materials budget for musk oil, by quarter and in total, for Year 2. At the bottom of your budget, show the amount of purchases in roubles for each quarter and for the year in total.

BRIEF EXERCISE 7-5 Direct Labor Budget [LO5]

The production manager of Rordan Corporation has submitted the following forecast of units to be produced by quarter for the upcoming fiscal year:

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Units to be produced	8,000	6,500	7,000	7,500

Each unit requires 0.35 direct labor-hours, and direct laborers are paid \$12.00 per hour.

Required:

1. Construct the company's direct labor budget for the upcoming fiscal year, assuming that the direct labor workforce is adjusted each quarter to match the number of hours required to produce the forecasted number of units produced.
2. Construct the company's direct labor budget for the upcoming fiscal year, assuming that the direct labor workforce is not adjusted each quarter. Instead, assume that the company's direct labor workforce consists of permanent employees who are guaranteed to be paid for at least 2,600 hours of work each quarter. If the number of required direct labor-hours is less than this number, the workers are paid for 2,600 hours anyway. Any hours worked in excess of 2,600 hours in a quarter are paid at the rate of 1.5 times the normal hourly rate for direct labor.

BRIEF EXERCISE 7-6 Manufacturing Overhead Budget [LO6]

The direct labor budget of Yuvwell Corporation for the upcoming fiscal year contains the following details concerning budgeted direct labor-hours:

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Budgeted direct labor-hours	8,000	8,200	8,500	7,800

The company's variable manufacturing overhead rate is \$3.25 per direct labor-hour and the company's fixed manufacturing overhead is \$48,000 per quarter. The only noncash item included in fixed manufacturing overhead is depreciation, which is \$16,000 per quarter.

Required:

1. Construct the company's manufacturing overhead budget for the upcoming fiscal year.
2. Compute the company's manufacturing overhead rate (including both variable and fixed manufacturing overhead) for the upcoming fiscal year. Round off to the nearest whole cent.

BRIEF EXERCISE 7-7 Selling and Administrative Expense Budget [LO7]

The budgeted unit sales of Weller Company for the upcoming fiscal year are provided below:

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Budgeted unit sales	15,000	16,000	14,000	13,000

The company's variable selling and administrative expense per unit is \$2.50. Fixed selling and administrative expenses include advertising expenses of \$8,000 per quarter, executive salaries of \$35,000 per quarter, and depreciation of \$20,000 per quarter. In addition, the company will make insurance payments of \$5,000 in the first quarter and \$5,000 in the third quarter. Finally, property taxes of \$8,000 will be paid in the second quarter.

Required:

Prepare the company's selling and administrative expense budget for the upcoming fiscal year.



BRIEF EXERCISE 7-8 Cash Budget [LO8]

Garden Depot is a retailer that is preparing its budget for the upcoming fiscal year. Management has prepared the following summary of its budgeted cash flows:

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Total cash receipts	\$180,000	\$330,000	\$210,000	\$230,000
Total cash disbursements	\$260,000	\$230,000	\$220,000	\$240,000

The company’s beginning cash balance for the upcoming fiscal year will be \$20,000. The company requires a minimum cash balance of \$10,000 and may borrow any amount needed from a local bank at a quarterly interest rate of 3%. The company may borrow any amount at the beginning of any quarter and may repay its loans, or any part of its loans, at the end of any quarter. Interest payments are due on any principal at the time it is repaid. For simplicity, assume that interest is not compounded.

Required:

Prepare the company’s cash budget for the upcoming fiscal year.



BRIEF EXERCISE 7-9 Budgeted Income Statement [LO9]

Gig Harbor Boating is the wholesale distributor of a small recreational catamaran sailboat. Management has prepared the following summary data to use in its annual budgeting process:

Budgeted unit sales	460
Selling price per unit.....	\$1,950
Cost per unit	\$1,575
Variable selling and administrative expenses (per unit)	\$75
Fixed selling and administrative expenses (per year)	\$105,000
Interest expense for the year.....	\$14,000

Required:

Prepare the company’s budgeted income statement. Use the absorption costing income statement format shown in Schedule 9.



BRIEF EXERCISE 7-10 Budgeted Balance Sheet [LO10]

The management of Mecca Copy, a photocopying center located on University Avenue, has compiled the following data to use in preparing its budgeted balance sheet for next year:

	Ending Balances
Cash	?
Accounts receivable	\$8,100
Supplies inventory	\$3,200
Equipment	\$34,000
Accumulated depreciation	\$16,000
Accounts payable	\$1,800
Common stock.....	\$5,000
Retained earnings	?

The beginning balance of retained earnings was \$28,000, net income is budgeted to be \$11,500, and dividends are budgeted to be \$4,800.

Required:

Prepare the company’s budgeted balance sheet.

EXERCISE 7-11 Cash Budget Analysis [LO8]

A cash budget, by quarters, is given below for a retail company (000 omitted). The company requires a minimum cash balance of at least \$5,000 to start each quarter.



	Quarter				Year
	1	2	3	4	
Cash balance, beginning	\$ 6	\$?	\$?	\$?	\$?
Add collections from customers	?	?	96	?	323
Total cash available	71	?	?	?	?
Less disbursements:					
Purchase of inventory	35	45	?	35	?
Operating expenses	?	30	30	?	113
Equipment purchases	8	8	10	?	36
Dividends	2	2	2	2	?
Total disbursements.....	?	85	?	?	?
Excess (deficiency) of cash available over disbursements	(2)	?	11	?	?
Financing:					
Borrowings	?	15	—	—	?
Repayments (including interest)*	—	—	(?)	(17)	(?)
Total financing	?	?	?	?	?
Cash balance, ending	\$?	\$?	\$?	\$?	\$?

*Interest will total \$1,000 for the year.

Required:

Fill in the missing amounts in the above table.

EXERCISE 7-12 Production and Direct Materials Budgets [LO3, LO4]

The marketing department of Gaerber Industries has submitted the following sales forecast for the upcoming fiscal year:

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Budgeted unit sales	8,000	7,000	6,000	7,000

The company expects to start the first quarter with 1,600 units in finished goods inventory. Management desires an ending finished goods inventory in each quarter equal to 20% of the next quarter's budgeted sales. The desired ending finished goods inventory for the fourth quarter is 1,700 units.

In addition, the beginning raw materials inventory for the first quarter is budgeted to be 3,120 pounds and the beginning accounts payable for the first quarter is budgeted to be \$14,820.

Each unit requires 2 pounds of raw material that costs \$4.00 per pound. Management desires to end each quarter with an inventory of raw materials equal to 20% of the following quarter's production needs. The desired ending inventory for the fourth quarter is 3,140 pounds. Management plans to pay for 75% of raw material purchases in the quarter acquired and 25% in the following quarter.

Required:

1. Prepare the company's production budget for the upcoming fiscal year.
2. Prepare the company's direct materials budget and schedule of expected cash disbursements for purchases of materials for the upcoming fiscal year.

EXERCISE 7-13 Sales and Production Budgets [LO2, LO3]

The marketing department of Jessi Corporation has submitted the following sales forecast for the upcoming fiscal year (all sales are on account):

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Budgeted unit sales	11,000	12,000	14,000	13,000

The selling price of the company's product is \$18.00 per unit. Management expects to collect 65% of sales in the quarter in which the sales are made, 30% in the following quarter, and 5% of sales are expected to be uncollectible. The beginning balance of accounts receivable, all of which is expected to be collected in the first quarter, is \$70,200.

The company expects to start the first quarter with 1,650 units in finished goods inventory. Management desires an ending finished goods inventory in each quarter equal to 15% of the next quarter's budgeted sales. The desired ending finished goods inventory for the fourth quarter is 1,850 units.

Required:

1. Prepare the company's sales budget and schedule of expected cash collections.
2. Prepare the company's production budget for the upcoming fiscal year.

EXERCISE 7-14 Direct Materials and Direct Labor Budgets [LO4, LO5]

The production department of Hareston Company has submitted the following forecast of units to be produced by quarter for the upcoming fiscal year:

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Units to be produced	7,000	8,000	6,000	5,000

In addition, the beginning raw materials inventory for the first quarter is budgeted to be 1,400 pounds and the beginning accounts payable for the first quarter is budgeted to be \$2,940.

Each unit requires 2 pounds of raw material that costs \$1.40 per pound. Management desires to end each quarter with an inventory of raw materials equal to 10% of the following quarter's production needs. The desired ending inventory for the fourth quarter is 1,500 pounds. Management plans to pay for 80% of raw material purchases in the quarter acquired and 20% in the following quarter. Each unit requires 0.60 direct labor-hours and direct labor-hour workers are paid \$14.00 per hour.

Required:

1. Prepare the company's direct materials budget and schedule of expected cash disbursements for purchases of materials for the upcoming fiscal year.
2. Prepare the company's direct labor budget for the upcoming fiscal year, assuming that the direct labor workforce is adjusted each quarter to match the number of hours required to produce the forecasted number of units produced.

EXERCISE 7-15 Direct Labor and Manufacturing Overhead Budgets [LO5, LO6]

The production department of Raredon Corporation has submitted the following forecast of units to be produced by quarter for the upcoming fiscal year:

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Units to be produced	12,000	14,000	13,000	11,000

Each unit requires 0.70 direct labor-hours, and direct labor-hour workers are paid \$10.50 per hour.

In addition, the variable manufacturing overhead rate is \$1.50 per direct labor-hour. The fixed manufacturing overhead is \$80,000 per quarter. The only noncash element of manufacturing overhead is depreciation, which is \$22,000 per quarter.

Required:

1. Prepare the company's direct labor budget for the upcoming fiscal year, assuming that the direct labor workforce is adjusted each quarter to match the number of hours required to produce the forecasted number of units produced.
2. Prepare the company's manufacturing overhead budget.



PROBLEMS

Alternate problem set is available on the text website.

PROBLEM 7-16A Production and Direct Materials Budgets [LO3, LO4]

Pearl Products Limited of Shenzhen, China, manufactures and distributes toys throughout South East Asia. Three cubic centimeters (cc) of solvent H300 are required to manufacture each unit of Supermix, one of the company's products. The company is now planning raw materials needs for the third quarter, the quarter in which peak sales of Supermix occur. To keep production and sales moving smoothly, the company has the following inventory requirements:

- a. The finished goods inventory on hand at the end of each month must be equal to 3,000 units of Supermix plus 20% of the next month's sales. The finished goods inventory on June 30 is budgeted to be 10,000 units.
- b. The raw materials inventory on hand at the end of each month must be equal to one-half of the following month's production needs for raw materials. The raw materials inventory on June 30 is budgeted to be 54,000 cc of solvent H300.
- c. The company maintains no work in process inventories.

A sales budget for Supermix for the last six months of the year follows.

	Budgeted Sales in Units
July	35,000
August	40,000
September	50,000
October	30,000
November	20,000
December	10,000

CHECK FIGURE

(1) July: 36,000 units



Required:

1. Prepare a production budget for Supermix for the months July, August, September, and October.
2. Examine the production budget that you prepared in (1) above. Why will the company produce more units than it sells in July and August, and fewer units than it sells in September and October?
3. Prepare a direct materials budget showing the quantity of solvent H300 to be purchased for July, August, and September, and for the quarter in total.

PROBLEM 7-17A Schedules of Expected Cash Collections and Disbursements [LO2, LO4, LO8]

You have been asked to prepare a December cash budget for Ashton Company, a distributor of exercise equipment. The following information is available about the company's operations:

- a. The cash balance on December 1 is \$40,000.
- b. Actual sales for October and November and expected sales for December are as follows:

	October	November	December
Cash sales	\$65,000	\$70,000	\$83,000
Sales on account	\$400,000	\$525,000	\$600,000

CHECK FIGURE

(3) Ending cash balance: \$20,000



Sales on account are collected over a three-month period as follows: 20% collected in the month of sale, 60% collected in the month following sale, and 18% collected in the second month following sale. The remaining 2% is uncollectible.

- c. Purchases of inventory will total \$280,000 for December. Thirty percent of a month's inventory purchases are paid during the month of purchase. The accounts payable remaining from November's inventory purchases total \$161,000, all of which will be paid in December.

- d. Selling and administrative expenses are budgeted at \$430,000 for December. Of this amount, \$50,000 is for depreciation.
- e. A new Web server for the Marketing Department costing \$76,000 will be purchased for cash during December, and dividends totaling \$9,000 will be paid during the month.
- f. The company maintains a minimum cash balance of \$20,000. An open line of credit is available from the company's bank to bolster the cash position as needed.

Required:

- 1. Prepare a schedule of expected cash collections for December.
- 2. Prepare a schedule of expected cash disbursements for merchandise purchases for December.
- 3. Prepare a cash budget for December. Indicate in the financing section any borrowing that will be needed during the month. Assume that any interest will not be paid until the following month.

CHECK FIGURE

- (1) Ending cash balance: \$8,900

PROBLEM 7-18A Cash Budget; Income Statement; Balance Sheet [LO2, LO4, LO8, LO9, LO10]

Minden Company is a wholesale distributor of premium European chocolates. The company's balance sheet as of April 30 is given below:



Minden Company Balance Sheet April 30	
Assets	
Cash.....	\$ 9,000
Accounts receivable.....	54,000
Inventory.....	30,000
Buildings and equipment, net of depreciation.....	207,000
Total assets.....	<u>\$300,000</u>
Liabilities and Stockholders' Equity	
Accounts payable.....	\$ 63,000
Note payable.....	14,500
Capital stock, no par.....	180,000
Retained earnings.....	42,500
Total liabilities and stockholders' equity.....	<u>\$300,000</u>

The company is in the process of preparing budget data for May. A number of budget items have already been prepared, as stated below:

- a. Sales are budgeted at \$200,000 for May. Of these sales, \$60,000 will be for cash; the remainder will be credit sales. One-half of a month's credit sales are collected in the month the sales are made, and the remainder is collected in the following month. All of the April 30 accounts receivable will be collected in May.
- b. Purchases of inventory are expected to total \$120,000 during May. These purchases will all be on account. Forty percent of all purchases are paid for in the month of purchase; the remainder are paid in the following month. All of the April 30 accounts payable to suppliers will be paid during May.
- c. The May 31 inventory balance is budgeted at \$40,000.
- d. Selling and administrative expenses for May are budgeted at \$72,000, exclusive of depreciation. These expenses will be paid in cash. Depreciation is budgeted at \$2,000 for the month.
- e. The note payable on the April 30 balance sheet will be paid during May, with \$100 in interest. (All of the interest relates to May.)
- f. New refrigerating equipment costing \$6,500 will be purchased for cash during May.
- g. During May, the company will borrow \$20,000 from its bank by giving a new note payable to the bank for that amount. The new note will be due in one year.

Required:

- 1. Prepare a cash budget for May. Support your budget with a schedule of expected cash collections from sales and a schedule of expected cash disbursements for merchandise purchases.
- 2. Prepare a budgeted income statement for May. Use the absorption costing income statement format as shown in Schedule 9.
- 3. Prepare a budgeted balance sheet as of May 31.

PROBLEM 7-19A Schedule of Expected Cash Collections; Cash Budget [LO2, LO8]

The president of the retailer Prime Products has just approached the company's bank with a request for a \$30,000, 90-day loan. The purpose of the loan is to assist the company in acquiring inventories. Because the company has had some difficulty in paying off its loans in the past, the loan officer has asked for a cash budget to help determine whether the loan should be made. The following data are available for the months April through June, during which the loan will be used:

- a. On April 1, the start of the loan period, the cash balance will be \$24,000. Accounts receivable on April 1 will total \$140,000, of which \$120,000 will be collected during April and \$16,000 will be collected during May. The remainder will be uncollectible.
- b. Past experience shows that 30% of a month's sales are collected in the month of sale, 60% in the month following sale, and 8% in the second month following sale. The other 2% represents bad debts that are never collected. Budgeted sales and expenses for the three-month period follow:

	April	May	June
Sales (all on account)	\$300,000	\$400,000	\$250,000
Merchandise purchases	\$210,000	\$160,000	\$130,000
Payroll	\$20,000	\$20,000	\$18,000
Lease payments	\$22,000	\$22,000	\$22,000
Advertising	\$60,000	\$60,000	\$50,000
Equipment purchases	—	—	\$65,000
Depreciation	\$15,000	\$15,000	\$15,000

- c. Merchandise purchases are paid in full during the month following purchase. Accounts payable for merchandise purchases during March, which will be paid during April, total \$140,000.
- d. In preparing the cash budget, assume that the \$30,000 loan will be made in April and repaid in June. Interest on the loan will total \$1,200.

Required:

- 1. Prepare a schedule of expected cash collections for April, May, and June, and for the three months in total.
- 2. Prepare a cash budget, by month and in total, for the three-month period.
- 3. If the company needs a minimum cash balance of \$20,000 to start each month, can the loan be repaid as planned? Explain.

PROBLEM 7-20A Cash Budget with Supporting Schedules [LO2, LO4, LO8]

Garden Sales, Inc., sells garden supplies. Management is planning its cash needs for the second quarter. The company usually has to borrow money during this quarter to support peak sales of lawn care equipment, which occur during May. The following information has been assembled to assist in preparing a cash budget for the quarter:

- a. Budgeted monthly absorption costing income statements for April–July are:

	April	May	June	July
Sales	\$600,000	\$900,000	\$500,000	\$400,000
Cost of goods sold	<u>420,000</u>	<u>630,000</u>	<u>350,000</u>	<u>280,000</u>
Gross margin	<u>180,000</u>	<u>270,000</u>	<u>150,000</u>	<u>120,000</u>
Selling and administrative expenses:				
Selling expense	79,000	120,000	62,000	51,000
Administrative expense*	<u>45,000</u>	<u>52,000</u>	<u>41,000</u>	<u>38,000</u>
Total selling and administrative expenses	<u>124,000</u>	<u>172,000</u>	<u>103,000</u>	<u>89,000</u>
Net operating income	<u>\$ 56,000</u>	<u>\$ 98,000</u>	<u>\$ 47,000</u>	<u>\$ 31,000</u>

*Includes \$20,000 of depreciation each month.

- b. Sales are 20% for cash and 80% on account.

CHECK FIGURE

- (1) May cash collections: \$316,000;
- (2) May ending cash balance: \$26,000



CHECK FIGURE

- (2a) May purchases: \$574,000;
- (3) June 30 cash balance: \$57,100



- c. Sales on account are collected over a three-month period with 10% collected in the month of sale; 70% collected in the first month following the month of sale; and the remaining 20% collected in the second month following the month of sale. February's sales totaled \$200,000, and March's sales totaled \$300,000.
- d. Inventory purchases are paid for within 15 days. Therefore, 50% of a month's inventory purchases are paid for in the month of purchase. The remaining 50% is paid in the following month. Accounts payable at March 31 for inventory purchases during March total \$126,000.
- e. Each month's ending inventory must equal 20% of the cost of the merchandise to be sold in the following month. The merchandise inventory at March 31 is \$84,000.
- f. Dividends of \$49,000 will be declared and paid in April.
- g. Land costing \$16,000 will be purchased for cash in May.
- h. The cash balance at March 31 is \$52,000; the company must maintain a cash balance of at least \$40,000 at the end of each month.
- i. The company has an agreement with a local bank that allows the company to borrow in increments of \$1,000 at the beginning of each month, up to a total loan balance of \$200,000. The interest rate on these loans is 1% per month and for simplicity we will assume that interest is not compounded. The company would, as far as it is able, repay the loan plus accumulated interest at the end of the quarter.

Required:

1. Prepare a schedule of expected cash collections for April, May, and June, and for the quarter in total.
2. Prepare the following for merchandise inventory:
 - a. A merchandise purchases budget for April, May, and June.
 - b. A schedule of expected cash disbursements for merchandise purchases for April, May, and June, and for the quarter in total.
3. Prepare a cash budget for April, May, and June as well as in total for the quarter.

CHECK FIGURE

- (2) May purchases: \$64,800;
- (4) May 31 cash balance: \$4,590



PROBLEM 7-21A Completing a Master Budget [LO2, LO4, LO7, LO8, LO9, LO10]

The following data relate to the operations of Shilow Company, a wholesale distributor of consumer goods:

Current assets as of March 31:	
Cash.....	\$8,000
Accounts receivable.....	\$20,000
Inventory.....	\$36,000
Building and equipment, net.....	\$120,000
Accounts payable.....	\$21,750
Capital stock.....	\$150,000
Retained earnings.....	\$12,250

- a. The gross margin is 25% of sales.
- b. Actual and budgeted sales data:

March (actual).....	\$50,000
April.....	\$60,000
May.....	\$72,000
June.....	\$90,000
July.....	\$48,000

- c. Sales are 60% for cash and 40% on credit. Credit sales are collected in the month following sale. The accounts receivable at March 31 are a result of March credit sales.
- d. Each month's ending inventory should equal 80% of the following month's budgeted cost of goods sold.
- e. One-half of a month's inventory purchases is paid for in the month of purchase; the other half is paid for in the following month. The accounts payable at March 31 are the result of March purchases of inventory.
- f. Monthly expenses are as follows: commissions, 12% of sales; rent, \$2,500 per month; other expenses (excluding depreciation), 6% of sales. Assume that these expenses are paid monthly. Depreciation is \$900 per month (includes depreciation on new assets).

- g. Equipment costing \$1,500 will be purchased for cash in April.
- h. Management would like to maintain a minimum cash balance of at least \$4,000 at the end of each month. The company has an agreement with a local bank that allows the company to borrow in increments of \$1,000 at the beginning of each month, up to a total loan balance of \$20,000. The interest rate on these loans is 1% per month and for simplicity we will assume that interest is not compounded. The company would, as far as it is able, repay the loan plus accumulated interest at the end of the quarter.

Required:

Using the preceding data:

- 1. Complete the following schedule:

Schedule of Expected Cash Collections				
	April	May	June	Quarter
Cash sales	\$36,000			
Credit sales	<u>20,000</u>	_____	_____	_____
Total collections	<u>\$56,000</u>	=====	=====	=====

- 2. Complete the following:

Merchandise Purchases Budget				
	April	May	June	Quarter
Budgeted cost of goods sold.....	\$45,000*	\$54,000		
Add desired ending inventory	<u>43,200[†]</u>	_____	_____	_____
Total needs	88,200			
Less beginning inventory	<u>36,000</u>	_____	_____	_____
Required purchases.....	<u>\$52,200</u>	=====	=====	=====

*For April sales: \$60,000 sales × 75% cost ratio = \$45,000.
[†]\$54,000 × 80% = \$43,200.

Schedule of Expected Cash Disbursements—Merchandise Purchases				
	April	May	June	Quarter
March purchases	\$21,750			\$21,750
April purchases	26,100	\$26,100		52,200
May purchases				
June purchases				
Total disbursements	<u>\$47,850</u>	=====	=====	=====

- 3. Complete the following:

Schedule of Expected Cash Disbursements—Selling and Administrative Expenses				
	April	May	June	Quarter
Commissions	\$ 7,200			
Rent	2,500			
Other expenses	<u>3,600</u>	_____	_____	_____
Total disbursements	<u>\$13,300</u>	=====	=====	=====

4. Complete the following cash budget:

Cash Budget				
	April	May	June	Quarter
Cash balance, beginning	\$ 8,000			
Add cash collections	56,000			
Total cash available	64,000			
Less cash disbursements:				
For inventory	47,850			
For expenses	13,300			
For equipment	1,500			
Total cash disbursements	62,650			
Excess (deficiency) of cash	1,350			
Financing:				
Etc.				

5. Prepare an absorption costing income statement, similar to the one shown in Schedule 9 in the chapter, for the quarter ended June 30.
6. Prepare a balance sheet as of June 30.

CHECK FIGURE

- (2) First quarter disbursements: \$75,000;
(3) First quarter ending cash balance: \$12,000

Excel



PROBLEM 7-22A Cash Budget with Supporting Schedules [LO2, LO4, LO7, LO8]

Westex Products is a wholesale distributor of industrial cleaning products. When the treasurer of Westex Products approached the company's bank late in the current year seeking short-term financing, he was told that money was very tight and that any borrowing over the next year would have to be supported by a detailed statement of cash collections and disbursements. The treasurer also was told that it would be very helpful to the bank if borrowers would indicate the quarters in which they would be needing funds, as well as the amounts that would be needed, and the quarters in which repayments could be made.

Because the treasurer is unsure as to the particular quarters in which bank financing will be needed, he has assembled the following information to assist in preparing a detailed cash budget:

- a. Budgeted sales and merchandise purchases for next year, as well as actual sales and purchases for the last quarter of the current year, are:

	A	B	C	D
1				
2		Sales	Merchandise Purchases	
3	Current year:			
4	Fourth quarter actual	\$200,000	\$126,000	
5	Next year:			
6	First quarter estimated	\$300,000	\$186,000	
7	Second quarter estimated	\$400,000	\$246,000	
8	Third quarter estimated	\$500,000	\$305,000	
9	Fourth quarter estimated	\$200,000	\$126,000	
10				

- b. The company normally collects 65% of a quarter's sales before the quarter ends and another 33% in the following quarter. The remainder is uncollectible. This pattern of collections is now being experienced in the current year's fourth-quarter actual data.
- c. Eighty percent of a quarter's merchandise purchases are paid for within the quarter. The remainder is paid for in the following quarter.
- d. Selling and administrative expenses for next year are budgeted at \$50,000 per quarter plus 15% of sales. Of the fixed amount, \$20,000 each quarter is depreciation.
- e. The company will pay \$10,000 in dividends each quarter.
- f. Land purchases of \$75,000 will be made in the second quarter, and purchases of \$48,000 will be made in the third quarter. These purchases will be for cash.
- g. The Cash account contained \$10,000 at the end of the current year. The treasurer feels that this represents a minimum balance that must be maintained.
- h. The company has an agreement with a local bank that allows the company to borrow in increments of \$1,000 at the beginning of each quarter, up to a total loan balance of \$100,000. The interest rate on these loans is 2.5% per quarter and for simplicity we will assume that interest is not compounded. The company would, as far as it is able, repay the loan plus accumulated interest at the end of the year.
- i. At present, the company has no loans outstanding.

Required:

- 1. Prepare the following by quarter and in total for next year:
 - a. A schedule of expected cash collections.
 - b. A schedule of expected cash disbursements for merchandise purchases.
- 2. Compute the expected cash disbursements for selling and administrative expenses, by quarter and in total, for next year.
- 3. Prepare a cash budget, by quarter and in total, for next year.

PROBLEM 7-23A Integration of the Sales, Production, and Direct Materials Budgets [LO2, LO3, LO4]

CHECK FIGURE
(2) July: 36,000 units

Milo Company manufactures beach umbrellas. The company is preparing detailed budgets for the third quarter and has assembled the following information to assist in the budget preparation:

- a. The Marketing Department has estimated sales as follows for the remainder of the year (in units):

July	30,000	October	20,000
August	70,000	November	10,000
September	50,000	December	10,000

The selling price of the beach umbrellas is \$12 per unit.

- b. All sales are on account. Based on past experience, sales are collected in the following pattern:

30% in the month of sale
65% in the month following sale
5% uncollectible

Sales for June totaled \$300,000.

- c. The company maintains finished goods inventories equal to 15% of the following month's sales. This requirement will be met at the end of June.
- d. Each beach umbrella requires 4 feet of Gilden, a material that is sometimes hard to acquire. Therefore, the company requires that the ending inventory of Gilden be equal to 50% of the following month's production needs. The inventory of Gilden on hand at the beginning and end of the quarter will be:

June 30	72,000 feet
September 30	? feet

- c. Gilden costs \$0.80 per foot. One-half of a month's purchases of Gilden is paid for in the month of purchase; the remainder is paid for in the following month. The accounts payable on July 1 for purchases of Gilden during June will be \$76,000.

Required:

1. Prepare a sales budget, by month and in total, for the third quarter. (Show your budget in both units and dollars.) Also prepare a schedule of expected cash collections, by month and in total, for the third quarter.
2. Prepare a production budget for each of the months July–October.
3. Prepare a direct materials budget for Gilden, by month and in total, for the third quarter. Also prepare a schedule of expected cash disbursements for Gilden, by month and in total, for the third quarter.

CHECK FIGURE

- (2a) February purchases: \$315,000;
 (4) February ending cash balance: \$30,800



PROBLEM 7-24A Completing a Master Budget [LO2, LO4, LO7, LO8, LO9, LO10]

Hillyard Company, an office supplies specialty store, prepares its master budget on a quarterly basis. The following data have been assembled to assist in preparing the master budget for the first quarter:

- a. As of December 31 (the end of the prior quarter), the company's general ledger showed the following account balances:

	Debits	Credits
Cash	\$ 48,000	
Accounts receivable	224,000	
Inventory	60,000	
Buildings and equipment (net)	370,000	
Accounts payable		\$ 93,000
Capital stock		500,000
Retained earnings		109,000
	<u>\$702,000</u>	<u>\$702,000</u>

- b. Actual sales for December and budgeted sales for the next four months are as follows:

December (actual)	\$280,000
January	\$400,000
February	\$600,000
March	\$300,000
April	\$200,000

- c. Sales are 20% for cash and 80% on credit. All payments on credit sales are collected in the month following sale. The accounts receivable at December 31 are a result of December credit sales.
- d. The company's gross margin is 40% of sales. (In other words, cost of goods sold is 60% of sales.)
- e. Monthly expenses are budgeted as follows: salaries and wages, \$27,000 per month; advertising, \$70,000 per month; shipping, 5% of sales; other expenses, 3% of sales. Depreciation, including depreciation on new assets acquired during the quarter, will be \$42,000 for the quarter.
- f. Each month's ending inventory should equal 25% of the following month's cost of goods sold.
- g. One-half of a month's inventory purchases is paid for in the month of purchase; the other half is paid in the following month.
- h. During February, the company will purchase a new copy machine for \$1,700 cash. During March, other equipment will be purchased for cash at a cost of \$84,500.
- i. During January, the company will declare and pay \$45,000 in cash dividends.
- j. Management wants to maintain a minimum cash balance of \$30,000. The company has an agreement with a local bank that allows the company to borrow in increments of \$1,000 at the beginning of each month. The interest rate on these loans is 1% per month and for simplicity we will assume that interest is not compounded. The company would, as far as it is able, repay the loan plus accumulated interest at the end of the quarter.

Required:

Using the data above, complete the following statements and schedules for the first quarter:

1. Schedule of expected cash collections:

	January	February	March	Quarter
Cash sales	\$ 80,000			
Credit sales	<u>224,000</u>			
Total cash collections	<u>\$304,000</u>			

2. a. Merchandise purchases budget:

	January	February	March	Quarter
Budgeted cost of goods sold	\$240,000*	\$360,000		
Add desired ending inventory	<u>90,000[†]</u>			
Total needs.....	330,000			
Less beginning inventory.....	<u>60,000</u>			
Required purchases	<u>\$270,000</u>			

*\$400,000 sales × 60% cost ratio = \$240,000.
[†]\$360,000 × 25% = \$90,000.

b. Schedule of expected cash disbursements for merchandise purchases:

	January	February	March	Quarter
December purchases	\$ 93,000			\$ 93,000
January purchases	135,000	135,000		270,000
February purchases.....	—			
March purchases.....	<u>—</u>			
Total cash disbursements for purchases	<u>\$228,000</u>			

3. Schedule of expected cash disbursements for selling and administrative expenses:

	January	February	March	Quarter
Salaries and wages	\$ 27,000			
Advertising.....	70,000			
Shipping.....	20,000			
Other expenses	<u>12,000</u>			
Total cash disbursements for selling and administrative expenses ...	<u>\$129,000</u>			

4. Cash budget:

	January	February	March	Quarter
Cash balance, beginning.....	\$ 48,000			
Add cash collections	<u>304,000</u>			
Total cash available.....	<u>352,000</u>			
Less cash disbursements:				
Purchases of inventory	228,000			
Selling and administrative expenses	129,000			
Purchases of equipment	—			
Cash dividends	<u>45,000</u>			
Total cash disbursements	<u>402,000</u>			
Excess (deficiency) of cash	(50,000)			
Financing:				
Etc.				

- Prepare an absorption costing income statement for the quarter ending March 31 as shown in Schedule 9 in the chapter.
- Prepare a balance sheet as of March 31.

BUILDING YOUR SKILLS



ETHICS CHALLENGE [LO1]

Norton Company, a manufacturer of infant furniture and carriages, is in the initial stages of preparing the annual budget for next year. Scott Ford has recently joined Norton's accounting staff and is interested to learn as much as possible about the company's budgeting process. During a recent lunch with Marge Atkins, sales manager, and Pete Granger, production manager, Ford initiated the following conversation.

Ford: Since I'm new around here and am going to be involved with the preparation of the annual budget, I'd be interested to learn how the two of you estimate sales and production numbers.

Atkins: We start out very methodically by looking at recent history, discussing what we know about current accounts, potential customers, and the general state of consumer spending. Then, we add that usual dose of intuition to come up with the best forecast we can.

Granger: I usually take the sales projections as the basis for my projections. Of course, we have to make an estimate of what this year's ending inventories will be, which is sometimes difficult.

Ford: Why does that present a problem? There must have been an estimate of ending inventories in the budget for the current year.

Granger: Those numbers aren't always reliable because Marge makes some adjustments to the sales numbers before passing them on to me.

Ford: What kind of adjustments?

Atkins: Well, we don't want to fall short of the sales projections so we generally give ourselves a little breathing room by lowering the initial sales projection anywhere from 5% to 10%.

Granger: So, you can see why this year's budget is not a very reliable starting point. We always have to adjust the projected production rates as the year progresses and, of course, this changes the ending inventory estimates. By the way, we make similar adjustments to expenses by adding at least 10% to the estimates; I think everyone around here does the same thing.

Required:

- Marge Atkins and Pete Granger have described the use of what is sometimes called *budgetary slack*.
 - Explain why Atkins and Granger behave in this manner and describe the benefits they expect to realize from the use of budgetary slack.
 - Explain how the use of budgetary slack can adversely affect Atkins and Granger.
- As a management accountant, Scott Ford believes that the behavior described by Marge Atkins and Pete Granger may be unethical. By referring to the IMA's Statement of Ethical Professional Practice in the Prologue, explain why the use of budgetary slack may be unethical.

(CMA, adapted)



COMMUNICATING IN PRACTICE [LO1]

In the late 1980s and early 1990s, public universities found that they were no longer immune to the financial stress faced by their private sister institutions and corporate America. Budget cuts were in the air across the land. When the budget ax hit, the cuts often came without warning and their size was sometimes staggering. State support for some institutions dropped by 40% or more. Most university administrators had only experienced budget increases, never budget cuts. Also, the budget setbacks usually occurred at the most inopportune time—during the school year when contractual commitments with faculty and staff had been signed, programs had been planned, and students were enrolled and taking classes.

Required:

- Should the administration be "fair" to all affected and institute a round of across-the-board cuts whenever the state announces another subsidy reduction?
- If not across-the-board cutbacks in programs, then would you recommend more focused reductions, and if so, what priorities would you establish for bringing spending in line with revenues?
- Since these usually are not one-time-only cutbacks, how would you manage continuous, long-term reductions in budgets extending over a period of years?
- Should the decision-making process be top-down (centralized with top administrators) or bottom-up (participative)? Why?
- How should issues such as protect-your-turf mentality, resistance to change, and consensus building be dealt with?

CASE [LO2, LO4, LO8, LO9, LO10]

You have just been hired as a new management trainee by Earrings Unlimited, a distributor of earrings to various retail outlets located in shopping malls across the country. In the past, the company has done very little in the way of budgeting and at certain times of the year has experienced a shortage of cash.

CHECK FIGURE

- April purchases: 79,000 units;
- June 30 cash balance: \$94,700

Since you are well trained in budgeting, you have decided to prepare comprehensive budgets for the upcoming second quarter in order to show management the benefits that can be gained from an integrated budgeting program. To this end, you have worked with accounting and other areas to gather the information assembled below.



The company sells many styles of earrings, but all are sold for the same price—\$10 per pair. Actual sales of earrings for the last three months and budgeted sales for the next six months follow (in pairs of earrings):

January (actual).....	20,000	June (budget).....	50,000
February (actual)	26,000	July (budget).....	30,000
March (actual).....	40,000	August (budget)	28,000
April (budget).....	65,000	September (budget).....	25,000
May (budget)	100,000		

The concentration of sales before and during May is due to Mother's Day. Sufficient inventory should be on hand at the end of each month to supply 40% of the earrings sold in the following month.

Suppliers are paid \$4 for a pair of earrings. One-half of a month's purchases is paid for in the month of purchase; the other half is paid for in the following month. All sales are on credit, with no discount, and payable within 15 days. The company has found, however, that only 20% of a month's sales are collected in the month of sale. An additional 70% is collected in the following month, and the remaining 10% is collected in the second month following sale. Bad debts have been negligible.

Monthly operating expenses for the company are given below:

Variable:	
Sales commissions	4% of sales
Fixed:	
Advertising	\$200,000
Rent	\$18,000
Salaries	\$106,000
Utilities	\$7,000
Insurance	\$3,000
Depreciation.....	\$14,000

Insurance is paid on an annual basis, in November of each year.

The company plans to purchase \$16,000 in new equipment during May and \$40,000 in new equipment during June; both purchases will be for cash. The company declares dividends of \$15,000 each quarter, payable in the first month of the following quarter.

A listing of the company's ledger accounts as of March 31 is given below:

Assets	
Cash	\$ 74,000
Accounts receivable (\$26,000 February sales; \$320,000 March sales)	346,000
Inventory.....	104,000
Prepaid insurance.....	21,000
Property and equipment (net).....	950,000
Total assets	<u>\$1,495,000</u>
Liabilities and Stockholders' Equity	
Accounts payable	\$ 100,000
Dividends payable	15,000
Capital stock.....	800,000
Retained earnings	580,000
Total liabilities and stockholders' equity	<u>\$1,495,000</u>

The company maintains a minimum cash balance of \$50,000. All borrowing is done at the beginning of a month; any repayments are made at the end of a month.

The company has an agreement with a bank that allows the company to borrow in increments of \$1,000 at the beginning of each month. The interest rate on these loans is 1% per month and for simplicity we will assume that interest is not compounded. At the end of the quarter, the company would pay the bank all of the accumulated interest on the loan and as much of the loan as possible (in increments of \$1,000), while still retaining at least \$50,000 in cash.

Required:

Prepare a master budget for the three-month period ending June 30. Include the following detailed budgets:

1. a. A sales budget, by month and in total.
b. A schedule of expected cash collections from sales, by month and in total.
c. A merchandise purchases budget in units and in dollars. Show the budget by month and in total.
d. A schedule of expected cash disbursements for merchandise purchases, by month and in total.
2. A cash budget. Show the budget by month and in total. Determine any borrowing that would be needed to maintain the minimum cash balance of \$50,000.
3. A budgeted income statement for the three-month period ending June 30. Use the contribution approach.
4. A budgeted balance sheet as of June 30.

CHECK FIGURE

June excess of cash available over disbursements: \$41,800



TEAMWORK IN ACTION [LO2, LO4, LO6, LO8]

Roller, Ltd., of Melbourne, Australia, is the exclusive distributor in Australia and the South Pacific of a popular brand of in-line skates manufactured in Mexico. The company is in the process of putting together its cash budget for the second quarter—April, May, and June—of next year. The president of the company suspects that some financing will be required in the second quarter because sales are expanding and the company intends to make several major equipment purchases in that quarter. The president is confident that the company will be able to meet or exceed the following budgeted sales figures (all in Australian dollars) next year:

January	\$158,000	July	\$190,000
February	\$160,000	August.....	\$192,000
March.....	\$164,000	September	\$210,000
April	\$172,000	October.....	\$230,000
May.....	\$176,000	November	\$260,000
June.....	\$184,000	December	\$180,000

The following additional information will be used in formulating the cash budget:

- a. All of the company's sales are on credit. The company collects 30% of its billings in the month after the sale and the remaining 70% in the second month after the sale. Uncollectible accounts are negligible.
- b. The cost of goods sold is 75% of sales. Because of the shipping time from Mexico, the company orders skates from the manufacturer one month in advance of their expected sale. Roller, Ltd., desires to maintain little or no inventory.
- c. The company orders skates on credit from the manufacturer. The company pays half of its bill in the month after it orders the skates and the other half in the second month after it places the order.
- d. Operating expenses, other than cost of goods sold, are budgeted to be \$178,800 for the year. The composition of these expenses is given below. All of these expenses are incurred evenly throughout the year except for the property taxes. Property taxes are paid in four equal installments in the last month of each quarter.

Salaries and wages	\$120,000
Advertising and promotion.....	12,000
Property taxes	18,000
Insurance	4,800
Utilities	6,000
Depreciation	18,000
Total operating expenses.....	<u>\$178,800</u>

- c. Income tax payments are made by the company in the first month of each quarter based on the taxable income for the prior quarter. The income tax payment due in April is \$16,000.
- f. Because of expanding sales, the company plans to make equipment purchases of \$22,300 in April and \$29,000 in May. These purchases will not affect depreciation for the year.
- g. The company has a policy of maintaining an end-of-month cash balance of \$20,000. Cash is borrowed or invested monthly, as needed, to maintain this balance. All borrowing is done at the beginning of the month, and all investments and repayments are made at the end of the month. As of March 31, there are no investments of excess cash and no outstanding loans.
- h. The annual interest rate on loans from the bank is 12%. Compute interest on whole months ($\frac{1}{12}$, $\frac{2}{12}$, and so forth). The company will pay off any loans, including accumulated interest, at the end of the second quarter if sufficient cash is available.

Required:

The team should discuss and then respond to the following two questions:

1. Prepare a cash budget for Roller, Ltd., by month and in total for the second quarter.
2. Discuss why cash budgeting is particularly important for an expanding company like Roller, Ltd.

RESEARCH AND APPLICATION

[LO1]



The questions in this exercise give you an appreciation for the complexity of budgeting in a large multinational corporation. To answer the questions, you will need to download the **Procter & Gamble** (P&G) 2005 Annual Report at www.pg.com/investors/annualreports.jhtml and briefly refer to “Item 2: Properties” in P&G’s Form 10-K for the fiscal year ended June 30, 2005. To access the 10-K report, go to www.sec.gov/edgar/searchedgar/companysearch.html. Input CIK code 80424 and hit enter. In the gray box on the right-hand side of your computer screen define the scope of your search by inputting 10-K and then pressing enter. Select the 10-K with a filing date of August 29, 2005. You will also need to briefly refer to **Macy’s Inc.’s** Form 10-K for the fiscal year ended January 29, 2005. Macy’s CIK code is 794367 and its filing date is March 28, 2005. You do not need to print any documents to answer the questions.

Required:

1. What is P&G’s strategy for success in the marketplace? Does the company rely primarily on a customer intimacy, operational excellence, or product leadership customer value proposition? What evidence supports your conclusion?
2. What business risks does P&G face that may threaten its ability to satisfy stockholder expectations? What are some examples of control activities that the company could use to reduce these risks? (Hint: Focus on page 28 of the annual report).
3. What were P&G’s quarterly net sales for the fiscal year ended June 30, 2005? What were Federated Department Stores’ quarterly net sales for 2004? (Hint: see page 79 of its 10-K.) How does P&G’s quarterly sales trend compare to Federated Department Stores’ quarterly sales trend? Which of the two quarterly sales trends is likely to cause greater cash budgeting concerns? Why?
4. Describe the scope of P&G’s business in three respects—physical facilities, products, and customers. More specifically, how many manufacturing facilities does P&G operate globally? What are P&G’s three Global Business Units (GBUs)? Which of P&G’s 17 “billion dollar brands” are included in each of these GBUs? How many brands does P&G offer in total and in how many countries do they sell these brands? How many countries does P&G’s Market Development Organization operate in?
5. Describe five uncertainties that complicate P&G’s efforts to accurately forecast its sales and expenses.
6. P&G’s annual report briefly discusses the acquisition of Gillette (see pages 10–11). It acknowledges that Gillette has some different cultural norms in terms of how it defines accountability and communicates internally. Although not discussed in the annual report, how could differences in two organization’s budgeting practices be responsible for these types of divergent cultural norms?

8

Flexible Budgets and Performance Analysis

<< A LOOK BACK

In Chapter 7, we discussed the budgeting process and each of the budgets in the master budget.

A LOOK AT THIS CHAPTER

In Chapter 8, we begin the discussion of management control and performance measures. Flexible budgets, which estimate what costs and revenues should have been given the actual level of activity during the period, are used to analyze the results of operations. Flexible budgets are compared to planning budgets and to actual results.

A LOOK AHEAD >>

In Chapter 9, we look in greater detail at the spending variances introduced in Chapter 8. Standards are used to isolate the effects of various factors on actual results.

CHAPTER OUTLINE

Flexible Budgets

- Characteristics of a Flexible Budget
- Deficiencies of the Static Planning Budget
- How a Flexible Budget Works

Flexible Budget Variances

- Activity Variances
- Revenue and Spending Variances
- A Performance Report Combining Activity and Revenue and Spending Variances

- Performance Reports in Nonprofit Organizations
- Performance Reports in Cost Centers

Flexible Budgets with Multiple Cost Drivers

Some Common Errors



DECISION FEATURE

Controlling Costs—Rain or Shine

Totes»Isotoner Corporation is the world's largest marketer of umbrellas, gloves, rainwear, and other weather-related accessories. One of the company's costs is a "flex advertising" fee that it pays to department stores based on the stores' sales of totes»Isotoner products. The company prepares a management report that compares actual flex advertising costs *as a percentage of actual sales* to budgeted flex advertising costs *as a percentage of budgeted sales*. This is done because management expects a variable cost, such as flex advertising, to stay constant on a per sales dollar basis.

The company purposely does not compare its actual and budgeted *total dollar amounts* of flex advertising expense because it provides misleading feedback about managerial performance. For example, if actual sales exceed budgeted sales, a highly efficient manager could be naïvely penalized for incurring actual variable costs that exceed budgeted variable costs. Conversely, if actual sales are less than budgeted sales, an inefficient manager could be naïvely rewarded for incurring actual variable costs that are less than budgeted variable costs.

When it comes to fixed costs, totes»Isotoner monitors total dollar amounts rather than percentages. For example, the Information Technology (IT) Department incurs numerous costs that are not affected by sales variation within the relevant range. If percentages were used to manage these costs, an increase in sales would decrease the IT Department's total fixed costs as a percentage of sales, thereby sending misleading signals about managerial efficiency.

In addition to cost information, totes»Isotoner uses other nonfinancial performance measures to ensure its employees do not fixate on minimizing costs to the detriment of customers.

Source: Author's conversation with Donna Deye, Senior Vice-President and CFO, totes»Isotoner Corporation.

LEARNING OBJECTIVES



After studying Chapter 8, you should be able to:

- LO1** Prepare a flexible budget.
- LO2** Prepare a report showing activity variances.
- LO3** Prepare a report showing revenue and spending variances.
- LO4** Prepare a performance report that combines activity variances and revenue and spending variances.
- LO5** Prepare a flexible budget with more than one cost driver.
- LO6** Understand common errors made in preparing performance reports based on budgets and actual results.

In the last chapter we explored how budgets are developed before a period begins. Budgeting involves a lot of time and effort and the results of the budgeting process should not be shoved into a filing cabinet and forgotten. To be useful, budgets should provide guidance in conducting actual operations and should be part of the performance evaluation process. However, managers need to be very careful about how budgets are used. In government, budgets often establish how much will be spent and indeed, spending more than was budgeted may be a criminal offense. That is not true in other organizations. In for-profit organizations, actual spending will rarely be the same as the spending that was budgeted at the beginning of the period. The reason is that the actual level of activity (such as unit sales) will rarely be the same as the budgeted activity; therefore, many actual costs and revenues will naturally differ from what was budgeted. Should a manager be penalized for spending 10% more than budgeted for a variable cost like direct materials if unit sales are 10% higher than budgeted? Of course not. In this chapter we will explore how budgets can be adjusted so that meaningful comparisons to actual costs can be made.

FLEXIBLE BUDGETS

LEARNING OBJECTIVE 1

Prepare a flexible budget.



Characteristics of a Flexible Budget

The budgets that we explored in the last chapter were *planning budgets*. A **planning budget** is prepared before the period begins and is valid for only the planned level of activity. A static planning budget is suitable for planning but is inappropriate for evaluating how well costs are controlled. If the actual level of activity differs from what was planned, it would be misleading to compare actual costs to the static, unchanged planning budget. If activity is higher than expected, variable costs should be higher than expected; and if activity is lower than expected, variable costs should be lower than expected.

Flexible budgets take into account how changes in activity affect costs. A **flexible budget** is an estimate of what revenues and costs should have been, given the actual level of activity for the period. When a flexible budget is used in performance evaluation, actual costs are compared to what the costs *should have been for the actual level of activity during the period* rather than to the static planning budget. This is a very important distinction. If adjustments for the level of activity are not made, it is very difficult to interpret discrepancies between budgeted and actual costs.

IN BUSINESS

Why Do Companies Need Flexible Budgets?

The difficulty of accurately predicting future financial performance can be readily understood by reading the annual report of any publicly traded company. For example **Nucor Corporation**, a steel manufacturer headquartered in Charlotte, North Carolina, cites numerous reasons why its actual results may differ from expectations, including the following: (1) the supply and cost of raw materials, electricity, and natural gas may change unexpectedly; (2) the market demand for steel products may change; (3) competitive pressures from imports and substitute materials may intensify; (4) uncertainties regarding the global economy may affect customer demand; (5) changes to U.S. and foreign trade policy may alter current importing and exporting practices; and (6) new government regulations could significantly increase environmental compliance costs. Each of these factors could cause static budget revenues and/or costs to differ from actual results.

Source: Nucor Corporation 2004 annual report, p. 3.

Deficiencies of the Static Planning Budget

To illustrate the difference between a static planning budget and a flexible budget, consider Rick's Hairstyling, an upscale hairstyling salon located in Beverly Hills that is owned and managed by Rick Manzi. The salon has very loyal customers—many of whom are associated with the film industry. Recently Rick has been attempting to get better control of his revenues and costs, and at the urging of his accounting and business adviser, Victoria Kho, he has begun to prepare monthly budgets. Victoria Kho is an accountant in independent practice who specializes in small service-oriented businesses like Rick's Hairstyling.

At the end of February, Rick prepared the March budget that appears in Exhibit 8–1. Rick believes that the number of customers served in a month is the best way to measure the overall level of activity in his salon. He refers to these visits as client-visits. A customer who comes into the salon and has his or her hair styled is counted as one client-visit.

Note that the term *revenue* is used in the planning budget rather than *sales*. We use the term revenue throughout the chapter because some organizations have sources of revenue other than sales. For example, donations, as well as sales, are counted as revenue in non-profit organizations.

Rick has identified eight major categories of costs—wages and salaries, hairstyling supplies, client gratuities, electricity, rent, liability insurance, employee health insurance, and miscellaneous. Client gratuities consist of flowers, candies, and glasses of champagne that Rick gives to his customers while they are in the salon.

Working with Victoria, Rick had already estimated a cost formula for each cost. For example, they determined that the cost formula for electricity should be $\$1,500 + \$0.10q$, where q equals the number of client-visits. In other words, electricity is a mixed cost with a \$1,500 fixed element and a \$0.10 per client-visit variable element. Once the budgeted level of activity was set at 1,000 client-visits, it was easy to compute the budgeted amount for each line item in the budget. For example, using the cost formula, the budgeted cost for electricity was set at $\$1,600 (= \$1,500 + \$0.10 \times 1,000)$.

At the end of March, Rick found that his actual profit was $\$21,230$ as shown in the income statement in Exhibit 8–2. It is important to realize that the actual results are *not* determined by plugging the actual number of client-visits into the revenue and cost formulas. The formulas are simply estimates of what the revenues and costs should be for a given level of activity. What actually happens usually differs from what is supposed to happen.

Rick's Hairstyling Planning Budget For the Month Ended March 31

Budgeted client-visits (q)	1,000
Revenue ($\$180.00q$).....	<u>\$180,000</u>
Expenses:	
Wages and salaries ($\$65,000 + \$37.00q$).....	102,000
Hairstyling supplies ($\$1.50q$)	1,500
Client gratuities ($\$4.10q$).....	4,100
Electricity ($\$1,500 + \$0.10q$).....	1,600
Rent ($\$28,500$)	28,500
Liability insurance ($\$2,800$)	2,800
Employee health insurance ($\$21,300$)	21,300
Miscellaneous ($\$1,200 + \$0.20q$).....	<u>1,400</u>
Total expense	163,200
Net operating income	<u><u>\$ 16,800</u></u>

EXHIBIT 8–1
Planning Budget

EXHIBIT 8-2

Actual Results—Income Statement

Rick's Hairstyling Income Statement For the Month Ended March 31	
Actual client-visits	1,100
Revenue	<u>\$194,200</u>
Expenses:	
Wages and salaries	106,900
Hairstyling supplies	1,620
Client gratuities	6,870
Electricity	1,550
Rent	28,500
Liability insurance	2,800
Employee health insurance	22,600
Miscellaneous	2,130
Total expense	<u>172,970</u>
Net operating income	<u>\$ 21,230</u>

Referring back to Exhibit 8-1, the budgeted net operating income was \$16,800, so the actual profit was substantially higher than planned at the beginning of the month. This was, of course, good news, but Rick wanted to know more. Business was up by 10%—the salon had 1,100 client-visits instead of the budgeted 1,000 client-visits. Could this alone explain the higher net income? The answer is no. An increase in net operating income of 10% would have resulted in net operating income of only \$18,480 ($= 1.1 \times \$16,800$), not the \$21,230 actually earned during the month. What is responsible for this better outcome? Higher prices? Lower costs? Something else? Whatever the cause, Rick would like to know the answer and then hopefully repeat the same performance next month.

In an attempt to analyze what happened in March, Rick prepared the report comparing actual to budgeted costs that appears in Exhibit 8-3. Note that most of the variances in this report are labeled unfavorable (U) rather than favorable (F) even though net operating

EXHIBIT 8-3

Comparison of Static Planning Budget to Actual Results

Rick's Hairstyling Comparison of Planning Budget to Actual Results For the Month Ended March 31			
	Planning Budget	Actual Results	Variances
Client-visits	1,000	1,100	
Revenue	<u>\$180,000</u>	<u>\$194,200</u>	<u>\$14,200 F</u>
Expenses:			
Wages and salaries	102,000	106,900	4,900 U
Hairstyling supplies	1,500	1,620	120 U
Client gratuities	4,100	6,870	2,770 U
Electricity	1,600	1,550	50 F
Rent	28,500	28,500	0
Liability insurance	2,800	2,800	0
Employee health insurance	21,300	22,600	1,300 U
Miscellaneous	1,400	2,130	730 U
Total expense	<u>163,200</u>	<u>172,970</u>	<u>9,770 U</u>
Net operating income	<u>\$ 16,800</u>	<u>\$ 21,230</u>	<u>\$ 4,430 F</u>

income was actually higher than expected. For example, wages and salaries show an unfavorable variance of \$4,900 because the budget called for wages and salaries of \$102,000, whereas the actual wages and salaries expense was \$106,900. The problem with the report, as Rick immediately realized, is that it compares revenues and costs at one level of activity (1,000 client-visits) to revenues and costs at a different level of activity (1,100 client-visits). This is like comparing apples to oranges. Because Rick had 100 more client-visits than expected, some of his costs should be higher than budgeted. From Rick's standpoint, the increase in activity was good and should be counted as a favorable variance, but the increase in activity has an apparently negative impact on most of the costs in the report. Rick knew that something would have to be done to make the report more meaningful, but he was unsure of what to do. So he made an appointment to meet with Victoria Kho to discuss the next step.

Victoria: How is the budgeting going?

Rick: Pretty well. I didn't have any trouble putting together the budget for March. I also prepared a report comparing the actual results for March to the budget, but that report isn't giving me what I really want to know.

Victoria: Because your actual level of activity didn't match your budgeted activity?

Rick: Right. I know the level of activity shouldn't affect my fixed costs, but we had more client-visits than I had expected and that had to affect my other costs.

Victoria: So you want to know whether the higher actual costs are justified by the higher level of activity you actually had in March?

Rick: Precisely.

Victoria: If you leave your reports and data with me, I can work on it later today, and by tomorrow I'll have a report to show you.

**MANAGERIAL
ACCOUNTING IN
ACTION**
The Issue



How a Flexible Budget Works

A flexible budget approach recognizes that a budget can be adjusted to show what costs *should be* for the actual level of activity. To illustrate how flexible budgets work, Victoria prepared the report in Exhibit 8-4 that shows what the *revenues and costs should have been given the actual level of activity* in March. Preparing the report is straightforward. The cost formula for each cost is used to estimate what the cost should have been for 1,100 client-visits—the actual level of activity for March. For example, using the cost

**Rick's Hairstyling
Flexible Budget
For the Month Ended March 31**

Actual client-visits (<i>q</i>)	1,100
Revenue (\$180.00 <i>q</i>)	\$198,000
Expenses:	
Wages and salaries ($\$65,000 + \$37.00q$)	105,700
Hairstyling supplies ($\$1.50q$)	1,650
Client gratuities ($\$4.10q$)	4,510
Electricity ($\$1,500 + \$0.10q$)	1,610
Rent (\$28,500)	28,500
Liability insurance (\$2,800)	2,800
Employee health insurance (\$21,300)	21,300
Miscellaneous ($\$1,200 + \$0.20q$)	1,420
Total expense	167,490
Net operating income	\$ 30,510

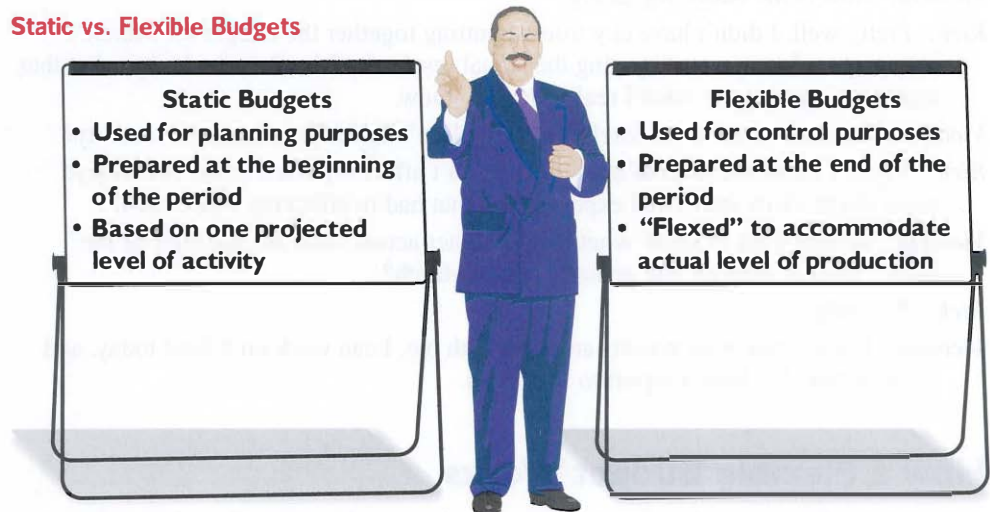
EXHIBIT 8-4
Flexible Budget Based on
Actual Activity

formula $\$1,500 + \$0.10q$, the cost of electricity in March *should have been* $\$1,610$ ($= \$1,500 + \$0.10 \times 1,100$).

We can see from the flexible budget that the net operating income in March *should have been* $\$30,510$, but recall from Exhibit 8–2 that the net operating income was actually only $\$21,230$. The results are not as good as we thought. Why? We will answer that question shortly.

To summarize to this point, Rick had budgeted for a profit of $\$16,800$. The actual profit was quite a bit higher— $\$21,230$. However, given the amount of business the salon had in March, the profit should have been even higher— $\$30,510$. What are the causes of these discrepancies? Rick would certainly like to build on the positive factors, while working to reduce the negative factors. But what are they?

Static vs. Flexible Budgets



CONCEPT CHECK ✓

- Which of the following statements is false? (You may select more than one answer.)
 - A flexible budget is used for control purposes and a static budget is used for planning purposes.
 - A flexible budget is prepared at the end of the period and a static budget is prepared at the beginning of the period.
 - A flexible budget is not useful for controlling variable costs.
 - A static budget provides budgeted estimates for one level of activity.
- A company's static budget estimate of total shipping cost was $\$100,000$ based on the assumption that 10,000 units would be produced and sold. The company estimates that 30% of this amount is variable and the remainder is fixed. What would be the total shipping cost if 12,000 units were produced and sold?
 - $\$96,000$
 - $\$100,000$
 - $\$106,000$
 - $\$116,000$

FLEXIBLE BUDGET VARIANCES

To answer Rick's questions concerning the discrepancies between budgeted and actual costs, we will need to break down the variances shown in Exhibit 8–3 into two types of variances—activity variances and revenue and spending variances. We do that in the next two sections.

Activity Variances

Part of the discrepancy between the budgeted profit and the actual profit is due to the fact that the actual level of activity in March was higher than expected. How much of this discrepancy was due to this single factor? The report in Exhibit 8–5 is designed to answer this question. In that report, the planning budget from the beginning of the period is compared to the flexible budget based on the actual level of activity for the period. The planning budget shows what should have happened at the budgeted level of activity whereas the flexible budget shows what should have happened at the actual level of activity. Therefore, the differences between the planning budget and the flexible budget show what should have happened solely because the actual level of activity differed from what had been expected.

For example, the budget based on 1,000 client-visits shows revenue of **\$180,000** ($= \$180 \text{ per client-visit} \times 1,000 \text{ client-visits}$). The flexible budget based on 1,100 client-visits shows revenue of **\$198,000** ($= \$180 \text{ per client-visit} \times 1,100 \text{ client-visits}$). Because the salon had 100 more client-visits than anticipated in the budget, actual revenue should have been higher than budgeted revenue by \$18,000 ($= \$198,000 - \$180,000$). This activity variance is shown on the report as **\$18,000 F** (favorable). Similarly, the budget based on 1,000 client-visits shows electricity costs of **\$1,600** ($= \$1,500 + \$0.10 \text{ per client-visit} \times 1,000 \text{ client-visits}$). The flexible budget based on 1,100 client-visits shows electricity costs of **\$1,610** ($= \$1,500 + \$0.10 \text{ per client-visit} \times 1,100 \text{ client-visits}$). Because the salon had 100 more client-visits than anticipated in the budget, actual electricity costs should have been higher than budgeted costs by \$10 ($= \$1,610 - \$1,600$). The activity variance for electricity is shown on the report as **\$10 U** (unfavorable). Note that in this case, the label “unfavorable” may be a little misleading. Costs *should* be \$10 higher for electricity simply because business was up by 100 client-visits; therefore, is this variance really unfavorable if it was a necessary cost of serving more customers? For reasons such as this, we would like to caution you against assuming that unfavorable variances always indicate bad performance and favorable variances always indicate good performance.

Because all of the variances on this report are solely due to the difference in the level of activity between the planning budget from the beginning of the period and the actual level of activity, they are called **activity variances**. For example, the activity variance

LEARNING OBJECTIVE 2

Prepare a report showing activity variances.



Rick's Hairstyling Activity Variances For the Month Ended March 31

	Planning Budget	Flexible Budget	Activity Variances
Client-visits.....	1,000	1,100	
Revenue (\$180.00q).....	\$180,000	\$198,000	\$18,000 F
Expenses:			
Wages and salaries (\$65,000 + \$37.00q).....	102,000	105,700	3,700 U
Hairstyling supplies (\$1.50q).....	1,500	1,650	150 U
Client gratuities (\$4.10q).....	4,100	4,510	410 U
Electricity (\$1,500 + \$0.10q).....	1,600	1,610	10 U
Rent (\$28,500).....	28,500	28,500	0
Liability insurance (\$2,800).....	2,800	2,800	0
Employee health insurance (\$21,300).....	21,300	21,300	0
Miscellaneous (\$1,200 + \$0.20q).....	1,400	1,420	20 U
Total expense.....	163,200	167,490	4,290 U
Net operating income.....	\$ 16,800	\$ 30,510	\$13,710 F

EXHIBIT 8-5

Activity Variances from Comparing the Planning Budget to the Flexible Budget Based on Actual Activity

for revenue is **\$18,000 F**, the activity variance for electricity is **\$10 U**, and so on. The most important activity variance appears at the very bottom of the report; namely, the **\$13,710 F** (favorable) variance for net operating income. This variance says that because activity was higher than expected in the planning budget, the net operating income should have been \$13,710 higher. We caution against placing too much emphasis on any other single variance in this report. As we have said above, one would expect some costs to be higher as a consequence of more business. It is somewhat misleading to think of these unfavorable variances as indicative of poor performance.

On the other hand, the favorable activity variance for net operating income is important. Let's explore this variance a bit more thoroughly. First, as we have already noted, activity was up by 10%, but the flexible budget indicates that net operating income should have increased much more than 10%. A 10% increase in net operating income from the \$16,800 in the planning budget would result in net operating income of \$18,480 ($= 1.1 \times \$16,800$); however, the flexible budget shows much higher net operating income of \$30,510. Why? The short answer is: Because of the presence of fixed costs. When we apply the 10% increase to the budgeted net operating income to estimate the profit at the higher level of activity, we implicitly assume that the revenues and *all* of the costs increase by 10%. But they do not. Note that when the activity level increases by 10%, three of the costs—rent, liability insurance, and employee health insurance—do not increase at all. These are all purely fixed costs. So while sales do increase by 10%, these costs do not increase. This results in net operating income increasing by more than 10%. A similar effect occurs with the mixed costs which contain fixed cost elements—wages and salaries, electricity, and miscellaneous. While sales increase by 10%, these mixed costs increase by less than 10%, resulting in an overall increase in net operating income of more than 10%. Because of the existence of fixed costs, net operating income does not change in proportion to changes in the level of activity. There is a leverage effect. The percentage changes in net operating income are ordinarily larger than the percentage increases in activity.

LEARNING OBJECTIVE 3

Prepare a report showing revenue and spending variances.



Revenue and Spending Variances

In the last section we answered the question “What impact did the change in activity have on our revenues, costs, and profit?” In this section we will answer the question “How well did we control our revenues, our costs, and our profit?”

Recall that the flexible budget based on the actual level of activity in Exhibit 8–4 shows what *should have happened given the actual level of activity*. If we compare this flexible budget to actual results, we compare what should have happened to what actually happened. This is done in Exhibit 8–6.

Focusing first on revenue, the flexible budget indicates that, given the actual level of activity, revenue should have been **\$198,000**. However, actual revenue totaled **\$194,200**. Consequently, revenue was \$3,800 less than it should have been, given the actual number of client-visits for the month. This discrepancy is labeled as a **\$3,800 U** (unfavorable) variance and is called a *revenue variance*. A **revenue variance** is the difference between what the total revenue should have been, given the actual level of activity for the period, and the actual total revenue. If actual revenue exceeds what the revenue should have been, the variance is labeled favorable. If actual revenue is less than what the revenue should have been, the variance is labeled unfavorable. Why would actual revenue be less than or more than it should have been, given the actual level of activity? Basically, the revenue variance is favorable if the average selling price is greater than expected; it is unfavorable if the average selling price is less than expected. This could happen for a variety of reasons including a change in selling price, a different mix of products sold, a change in the amount of discounts given, poor accounting controls, and so on.

Focusing next on costs, the flexible budget indicates that electricity costs should have been **\$1,610** for the 1,100 client-visits in March. However, the actual electricity cost was **\$1,550**. Because the cost was \$60 less than we would have expected for the actual level of activity during the period, it is labeled as a favorable variance, **\$60 F**. This is an example of a *spending variance*. By definition, a **spending variance** is the difference

Rick's Hairstyling
Revenue and Spending Variances
For the Month Ended March 31

	Flexible Budget	Actual Results	Revenue and Spending Variances
Client-visits.....	1,100	1,100	
Revenue (\$180.00q).....	<u>\$198,000</u>	<u>\$194,200</u>	<u>\$3,800 U</u>
Expenses:			
Wages and salaries (\$65,000 + \$37.00q)	105,700	106,900	1,200 U
Hairstyling supplies (\$1.50q).....	1,650	1,620	30 F
Client gratuities (\$4.10q).....	4,510	6,870	2,360 U
Electricity (\$1,500 + \$0.10q).....	1,610	1,550	60 F
Rent (\$28,500).....	28,500	28,500	0
Liability insurance (\$2,800).....	2,800	2,800	0
Employee health insurance (\$21,300).....	21,300	22,600	1,300 U
Miscellaneous (\$1,200 + \$0.20q).....	1,420	2,130	710 U
Total expense.....	<u>167,490</u>	<u>172,970</u>	<u>5,480 U</u>
Net operating income.....	<u>\$ 30,510</u>	<u>\$ 21,230</u>	<u>\$9,280 U</u>

EXHIBIT 8-6

Revenue and Spending Variances
 from Comparing the Flexible
 Budget to the Actual Results

between how much a cost should have been, given the actual level of activity, and the actual amount of the cost. If the actual cost is greater than what the cost should have been, the variance is labeled as unfavorable. If the actual cost is less than what the cost should have been, the variance is labeled as favorable. Why would a cost have a favorable or unfavorable variance? There are many possible explanations including paying a higher price for inputs than should have been paid, using too many inputs for the actual level of activity, a change in technology, and so on. In the next chapter we will delve into this topic in greater detail.

Note from Exhibit 8-6 that the overall net operating income variance is **\$9,280 U** (unfavorable). This means that given the actual level of activity for the period, the net operating income was \$9,280 lower than it should have been. There are a number of reasons for this. The most prominent is the unfavorable revenue variance of \$3,800. Next in line is the \$2,360 unfavorable variance for client gratuities. Looking at this in another way, client gratuities were more than 50% larger than they should have been according to the flexible budget. This is a variance that Rick would almost certainly want to investigate further. Rick may directly control the client gratuities himself. If not, he may want to know who authorized the additional expenditures. Why were they so large? Was more given away than usual? If so, why? Were more expensive gratuities given to clients? If so, why? Note that this unfavorable variance is not necessarily a bad thing. It is possible, for example, that more lavish use of gratuities led to the 10% increase in client-visits.

Owner of Micro-Brewery

YOU DECIDE

Hops is an essential ingredient in beer. The brewery's budget for the current month, which was based on the production of 800 barrels of beer, allowed for an expense of \$960 for hops. The actual production for the month was 850 barrels of beer and the actual cost of the hops used to produce that beer was \$1,020. Hops is a variable cost. Do you think the expense for hops for the month was too high?

LEARNING OBJECTIVE 4

Prepare a performance report that combines activity variances and revenue and spending variances.



A Performance Report Combining Activity and Revenue and Spending Variances

Exhibit 8–7 displays a performance report that combines the activity variances (from Exhibit 8–5) with the revenue and spending variances (from Exhibit 8–6). The report brings together information from those two earlier exhibits in a way that makes it easier to interpret what happened during the period. The format of this report is a bit different from the format of the previous reports in that the variances appear between the amounts being compared rather than after them. For example, the activity variances appear between the planning budget amounts and the flexible budget amounts. In Exhibit 8–5, the activity variances appeared after the planning budget and the flexible budget.

Note two numbers in particular in the performance report—the activity variance for net operating income of **\$13,710 F** (favorable) and the overall revenue and spending variance for net operating income of **\$9,280 U** (unfavorable). It is worth repeating what those two numbers mean. The \$13,710 favorable activity variance occurred because actual activity (1,100 client-visits) was greater than the budgeted level of activity (1,000 client-visits). The \$9,280 unfavorable overall revenue and spending variance occurred because the profit was not as large as it should have been for the actual level of activity for the period. These two different variances mean very different things and call for different types of actions. To generate a favorable activity variance for net operating income, managers must take actions to increase client-visits. To generate a favorable overall revenue and spending variance, managers must take actions to protect selling prices, increase operating efficiency, and reduce the prices of inputs.

The performance report in Exhibit 8–7 provides much more useful information to managers than the simple comparison of budgeted to actual results in Exhibit 8–3. In Exhibit 8–3, the effects of changes in activity were jumbled together with the effects of

EXHIBIT 8–7 Performance Report Combining Activity Variances with Revenue and Spending Variances

Rick's Hairstyling					
Flexible Budget Performance Report					
For the Month Ended March 31					
	(1)	Activity	(2)	Revenue and	(3)
	Planning	Variances	Flexible	Spending	Actual
	Budget	(2) – (1)	Budget	Variances	Results
				(3) – (2)	
Client-visits.....	1,000		1,100		1,100
Revenue (\$180.00q).....	\$180,000	\$18,000 F	\$198,000	\$3,800 U	\$194,200
Expenses:					
Wages and salaries (\$65,000 + \$37.00q).....	102,000	3,700 U	105,700	1,200 U	106,900
Hairstyling supplies (\$1.50q).....	1,500	150 U	1,650	30 F	1,620
Client gratuities (\$4.10q).....	4,100	410 U	4,510	2,360 U	6,870
Electricity (\$1,500 + \$0.10q).....	1,600	10 U	1,610	60 F	1,550
Rent (\$28,500).....	28,500	0	28,500	0	28,500
Liability insurance (\$2,800).....	2,800	0	2,800	0	2,800
Employee health insurance (\$21,300).....	21,300	0	21,300	1,300 U	22,600
Miscellaneous (\$1,200 + \$0.20q).....	1,400	20 U	1,420	710 U	2,130
Total expense.....	163,200	4,290 U	167,490	5,480 U	172,970
Net operating income.....	<u>\$ 16,800</u>	<u>\$13,710 F</u>	<u>\$ 30,510</u>	<u>\$9,280 U</u>	<u>\$ 21,230</u>

how well prices were controlled and operations were managed. The performance report in Exhibit 8–7 clearly separates these effects, allowing managers to take a much more focused approach in evaluating operations.

To get a better idea of how the performance report accomplishes this task, look at hairstyling supplies in the performance report. In the planning budget, this cost was \$1,500, whereas the actual cost for the period was \$1,620. In the comparison of the planning budget to actual results in Exhibit 8–3, this difference is shown as an unfavorable variance of \$120. Exhibit 8–3 uses a static planning budget approach that compares actual costs at one level of activity to budgeted costs at a different level of activity. As we said before, this is like comparing apples to oranges. This variance is actually a mixture of two very different effects. This becomes clear in the performance report in Exhibit 8–7. The difference between the budgeted amount and the actual results is composed of two different variances—an unfavorable activity variance of \$150 and a favorable spending variance of \$30. The activity variance occurs because activity was greater than anticipated in the planning budget, which naturally resulted in a higher total cost for this variable cost. The favorable spending variance occurred because less was spent on hairstyling supplies than one would have expected, given the actual level of activity for the month.

The flexible budget performance report in Exhibit 8–7 provides a more valid assessment of performance than simply comparing static planning budget costs to actual costs because actual costs are compared to what costs should have been at the actual level of activity. In other words, apples are compared to apples. When this is done, we see that the spending variance for hairstyling supplies is \$30 F (favorable) rather than \$120 U (unfavorable) as it was in the original static planning budget performance report (see Exhibit 8–3). In some cases, as with hairstyling supplies in Rick’s report, an unfavorable static planning budget variance may be transformed into a favorable revenue or spending variance when an increase in activity is properly taken into account. The following discussion took place the next day at Rick’s salon.

Victoria: Let me show you what I’ve got. [Victoria shows Rick the flexible budget performance report in Exhibit 8–7.] I simply used the cost formulas to update the budget to reflect the increase in client-visits you experienced in March. That allowed me to come up with a better benchmark for what the costs should have been.

Rick: That’s what you labeled the “flexible budget based on 1,100 client-visits”?

Victoria: That’s right. Your original budget was based on 1,000 client-visits, so it understated what some of the costs should have been when you actually served 1,100 customers.

Rick: That’s clear enough. These spending variances aren’t quite as shocking as the variances on my first report.

Victoria: Yes, but you still have an unfavorable variance of \$2,360 for client gratuities.

Rick: I know how that happened. In March there was a big Democratic Party fundraising dinner that I forgot about when I prepared the March budget. To fit all of our regular clients in, we had to push them through here pretty fast. Everyone still got top-rate service, but I felt bad about not being able to spend as much time with each customer. I wanted to give my customers a little extra something to compensate them for the less personal service, so I ordered a lot of flowers, which I gave away by the bunch.

Victoria: With the prices you charge, Rick, I am sure the gesture was appreciated.

Rick: One thing bothers me about the report. When we discussed my costs before, you called rent, liability insurance, and employee health insurance fixed costs. How can I have a variance for a fixed cost? Doesn’t fixed mean that it doesn’t change?

Victoria: We call these costs *fixed* because they shouldn’t be affected by *changes in the level of activity*. However, that doesn’t mean that they can’t change for other

**MANAGERIAL
ACCOUNTING IN
ACTION**
The Wrap-up

RICK'S
Hairstyling Salon



reasons. Also, the use of the term *fixed* also suggests to people that the cost can't be controlled, but that isn't true. It is often easier to control fixed costs than variable costs. For example, it would be fairly easy for you to change your insurance bill by adjusting the amount of insurance you carry. It would be much more difficult for you to significantly reduce your spending on hairstyling supplies—a variable cost that is a necessary part of serving customers.

Rick: I think I understand, but it is confusing.

Victoria: Just remember that a cost is called variable if it is proportional to activity; it is called fixed if it does not depend on the level of activity. However, fixed costs can change for reasons unrelated to changes in the level of activity. And controllability has little to do with whether a cost is variable or fixed. Fixed costs are often more controllable than variable costs.

DECISION MAKER

General Manager of a Luxury Resort

You are the general manager of a 200-room luxury resort in Arizona and are responsible for all aspects of operations. The budget for the current month called for total revenue from room rentals of \$2,362,500 based on 5,625 room-days. (A room-day is a room rented for one day.) The actual revenue from room rentals for the month amounted to \$2,502,800 for 6,250 room-days. Using the flexible budget approach, analyze these results.

Performance Reports in Nonprofit Organizations

The performance reports in nonprofit organizations are basically the same as the performance reports we have considered so far—with one prominent difference. Nonprofit organizations usually receive a significant amount of funding from sources other than sales. For example, universities receive their funding from sales (i.e., tuition charged to students), from endowment income and donations, and—in the case of public universities—from state appropriations. This means that, like costs, the revenue in governmental and nonprofit organizations may consist of both fixed and variable elements. For example, the **Seattle Opera Company**'s revenue in a recent year consisted of grants and donations of \$12,719,000 and ticket sales of \$8,125,000 (or about \$75.35 per ticket sold). Consequently, the revenue formula for the opera can be written as:

$$\text{Revenue} = \$12,719,000 + \$75.35q$$

where q is the number of tickets sold. In other respects, the performance report for the Seattle Opera and other nonprofit organizations would be similar to the performance report in Exhibit 8–7.

Performance Reports in Cost Centers

Performance reports are often prepared for organizations that do not have any source of outside revenue. In particular, in a large organization a performance report may be prepared for each department—including departments that do not sell anything to outsiders. For example, a performance report is very commonly prepared for production departments in manufacturing companies. Such reports should be prepared using the same principles we have discussed and should look very much like the performance report in Exhibit 8–7—with the exception that revenue, and consequently net operating income, will not appear on the report. Because the managers in these departments are responsible for costs, but not revenues, they are often called *cost centers*.

Focus On Opportunities

IN BUSINESS

The late management guru Peter F. Drucker cautioned managers that “almost without exception, the first page of the [monthly] report presents the areas in which results fall below expectations or in which expenditures exceed the budget. It focuses on problems. Problems cannot be ignored. But . . . enterprises have to focus on opportunities. That requires a small but fundamental procedural change: a new first page to the monthly report, one that precedes the page that shows the problems. The new page should focus on where results are better than expected. As much time should be spent on that new first page as traditionally was spent on the problem page.”

Source: Peter F. Drucker, “Change Leaders,” *Inc.* magazine, June 1999, pp. 65–72.

FLEXIBLE BUDGETS WITH MULTIPLE COST DRIVERS

At Rick’s Hairstyling, we have thus far assumed that there is only one cost driver—the number of client-visits. However, in the activity-based costing chapter, we found that more than one cost driver might be needed to adequately explain all of the costs in an organization. For example, some of the costs at Rick’s Hairstyling probably depend more on the number of hours that the salon is open for business than the number of client-visits. Specifically, most of Rick’s employees are paid salaries, but some are paid on an hourly basis. None of the employees is paid on the basis of the number of customers actually served. Consequently, the cost formula for wages and salaries would be more accurate if it were stated in terms of the hours of operation rather than the number of client-visits. The cost of electricity is even more complex. Some of the cost is fixed—the heat must be kept at some minimum level even at night when the salon is closed. Some of the cost depends on the number of client-visits—the power consumed by hair dryers depends on the number of customers served. Some of the cost depends on the number of hours the salon is open—the costs of lighting the salon and heating it to a comfortable temperature. Consequently, the cost formula for electricity would be more accurate if it were stated in terms of both the number of client-visits and the hours of operation rather than just on the number of client-visits.

Exhibit 8–8 shows a flexible budget in which these changes have been made. In that flexible budget, two cost drivers are listed—client-visits and hours of operation—where q_1 refers to client-visits and q_2 refers to hours of operation. For example, wages and salaries depend on the hours of operation and its cost formula is $\$65,000 + \$220q_2$. Because the salon actually operated 185 hours, the flexible budget amount for wages and salaries is \$105,700 ($= \$65,000 + \220×185). The electricity cost depends on both client-visits and the hours of operation and its cost formula is $\$390 + \$0.10q_1 + \$6.00q_2$. Since the actual number of client-visits was 1,100 and the salon actually operated for 185 hours, the flexible budget amount for electricity is \$1,610 ($= \$390 + \$0.10 \times 1,100 + \6.00×185).

This revised flexible budget based on both client-visits and hours of operation can be used exactly like we used the earlier flexible budget based on just client-visits to compute activity variances as in Exhibit 8–5, revenue and spending variances as in Exhibit 8–6, and a performance report as in Exhibit 8–7. The difference is that because the cost formulas based on more than one cost driver are more accurate than the cost formulas based on just one cost driver, the variances will also be more accurate.

LEARNING OBJECTIVE 5

Prepare a flexible budget with more than one cost driver.



EXHIBIT 8-8

Flexible Budget Based on More than One Cost Driver

Rick's Hairstyling
Flexible Budget
For the Month Ended March 31

Actual client-visits (q_1).....	1,100
Actual hours of operation (q_2).....	185
Revenue ($\$180.00q_1$).....	<u>\$198,000</u>
Expenses:	
Wages and salaries ($\$65,000 + \$220q_2$).....	105,700
Hairstyling supplies ($\$1.50q_1$).....	1,650
Client gratuities ($\$4.10q_1$).....	4,510
Electricity ($\$390 + \$0.10q_1 + \$6.00q_2$).....	1,610
Rent ($\$28,500$).....	28,500
Liability insurance ($\$2,800$).....	2,800
Employee health insurance ($\$21,300$).....	21,300
Miscellaneous ($\$1,200 + \$0.20q_1$).....	1,420
Total expense.....	<u>167,490</u>
Net operating income.....	<u>\$ 30,510</u>

**CONCEPT
CHECK** ✓

- A five-star hotel buys bouquets of flowers to decorate its common areas and guest rooms. Its flexible budget for flowers is \$325 per day of operations plus \$7.20 per room-day. (A room day is a room rented for one day; a room is decorated with flowers only if it is occupied.) If this month the hotel operated for 30 days and it had 7,680 room-days, what would be the flexible budget amount for flowers for the month?
 - \$55,296
 - \$65,046
 - \$9,750
 - \$332.20
- Refer to the data in the above question. If the actual spending on flowers for the month was \$61,978 and the hotel originally budgeted for 30 operating days and 7,500 room-days, what was the spending variance for the month?
 - \$3,068 Favorable
 - \$3,068 Unfavorable
 - \$1,772 Favorable
 - \$1,772 Unfavorable

IN BUSINESS**Hospitals Turn To Flexible Budgets**

Mary Wilkes, a senior managing director with **Phase 2 Consulting**, says that hospitals may have to pay as much as \$300,000 to install a flexible budgeting system, but the investment should readily pay for itself by enabling “more efficient use of hospital resources, particularly when it comes to labor.” One of the keys to creating an effective flexible budgeting system is to recognize the existence of multiple cost drivers. Many hospitals frequently use patient volume as a cost driver when preparing flexible budgets; however, other variables can influence revenues and costs. For example, the percentage of patients covered by private insurance, Medicaid, or Medicare, as well as the proportion of uninsured patients all influence revenues and costs. A flexible budgeting system that incorporates patient volume and these other variables will be more accurate than one based solely on patient volume.

Source: Paul Barr, “Flexing Your Budget,” *Modern Healthcare*, September 12, 2005, pp. 24–26.

SOME COMMON ERRORS

We started this chapter by discussing the need for managers to understand the difference between what was expected to happen—formalized by the planning budget—and what actually happened. To meet this need, we developed a flexible budget that allowed us to isolate activity variances and revenue and spending variances. Unfortunately, this approach is not always followed in practice—resulting in misleading and difficult-to-interpret reports. The most common errors in preparing performance reports are to implicitly assume that all costs are fixed or to implicitly assume that all costs are variable. These erroneous assumptions lead to inaccurate benchmarks and incorrect variances.

We have already discussed one of these errors—assuming that all costs are fixed. This is the error that is made when static planning budget costs are compared to actual costs without any adjustment for the actual level of activity. Such a comparison appeared in Exhibit 8–3. For convenience, the comparison of budgeted to actual revenues and costs is repeated in Exhibit 8–9. Looking at that exhibit, note that the budgeted cost of hairstyling supplies of \$1,500 is directly compared to the actual cost of \$1,620, resulting in an unfavorable variance of \$120. But this comparison only makes sense if the cost of hairstyling supplies is fixed. If the cost of hairstyling supplies isn't fixed (and indeed it is not), one would *expect* the cost to go up because of the increase in activity over the budget. Comparing static planning budget costs to actual costs only makes sense if the cost is fixed. If the cost isn't fixed, it needs to be adjusted for any change in activity that occurs during the period.

The other common error when comparing budgets to actual results is to assume that all costs are variable. A report that makes this error appears in Exhibit 8–10. The variances in this report are computed by comparing actual results to the amounts in the second numerical column where *all* of the budget items have been inflated by 10%—the percentage by which activity increased. This is a perfectly valid adjustment to make if an item is strictly variable—like sales and hairstyling supplies. It is *not* a valid adjustment if the item contains any fixed element. Take, for example, rent. If the salon serves 10% more customers in a given month, would you expect the rent to increase by 10%? The answer is no. Ordinarily, the rent is fixed in advance and does not depend on the volume of business. Therefore, the amount shown in the second numerical column of \$31,350 is incorrect, which leads to the erroneous favorable variance of \$2,850. In fact, the actual rent paid was exactly equal to the budgeted rent, so there should be no variance at all on a valid report.

LEARNING OBJECTIVE 6

Understand common errors made in preparing performance reports based on budgets and actual results.



Rick's Hairstyling
For the Month Ended March 31

	Planning Budget	Actual Results	Variances
Client-visits.....	1,000	1,100	
Revenue.....	<u>\$180,000</u>	<u>\$194,200</u>	<u>\$14,200 F</u>
Expenses:			
Wages and salaries.....	102,000	106,900	4,900 U
Hairstyling supplies.....	1,500	1,620	120 U
Client gratuities.....	4,100	6,870	2,770 U
Electricity.....	1,600	1,550	50 F
Rent.....	28,500	28,500	0
Liability insurance.....	2,800	2,800	0
Employee health insurance.....	21,300	22,600	1,300 U
Miscellaneous.....	1,400	2,130	730 U
Total expense.....	<u>163,200</u>	<u>172,970</u>	<u>9,770 U</u>
Net operating income.....	<u>\$ 16,800</u>	<u>\$ 21,230</u>	<u>\$ 4,430 F</u>

EXHIBIT 8–9
Faulty Analysis Comparing Budgeted Amounts to Actual Amounts (Implicitly Assumes All Income Statement Items Are Fixed)

EXHIBIT 8-10

Faulty Analysis That Assumes All Budget Items Are Variable

Rick's Hairstyling For the Month Ended March 31				
	(1)	(2)	(3)	Variances
	Planning Budget	Planning Budget × (1,100/1,000)	Actual Results	(3) – (2)
Client-visits.....	1,000		1,100	
Revenue.....	<u>\$180,000</u>	<u>\$198,000</u>	<u>\$194,200</u>	<u>\$3,800 U</u>
Expenses:				
Wages and salaries.....	102,000	112,200	106,900	5,300 F
Hairstyling supplies	1,500	1,650	1,620	30 F
Client gratuities.....	4,100	4,510	6,870	2,360 U
Electricity	1,600	1,760	1,550	210 F
Rent.....	28,500	31,350	28,500	2,850 F
Liability insurance.....	2,800	3,080	2,800	280 F
Employee health insurance	21,300	23,430	22,600	830 F
Miscellaneous.....	1,400	1,540	2,130	590 U
Total expense	<u>163,200</u>	<u>179,520</u>	<u>172,970</u>	<u>6,550 F</u>
Net operating income.....	<u>\$ 16,800</u>	<u>\$ 18,480</u>	<u>\$ 21,230</u>	<u>\$2,750 F</u>

IN BUSINESS**Know Your Costs**

Understanding the difference between fixed and variable costs can be critical. Kennard T. Wing, of **OMG Center for Collaborative Learning**, reports that a large health care system made the mistake of classifying all of its costs as variable. As a consequence, when volume dropped, managers felt that costs should be cut proportionately and more than 1,000 people were laid off—even though “the workload of most of them had no direct relation to patient volume. The result was that morale of the survivors plummeted and within a year the system was scrambling to replace not only those it had let go, but many others who had quit. The point is, the accounting systems we design and implement really do affect management decisions in significant ways. A system built on a bad model of the business will either not be used or, if used, will lead to bad decisions.”

Source: Kennard T. Wing, “Using Enhanced Cost Models in Variance Analysis for Better Control and Decision Making,” *Management Accounting Quarterly*, Winter 2000, pp. 27–35.

SUMMARY**LO1 Prepare a flexible budget.**

A flexible budget is a budget that is adjusted to the actual level of activity. It is the best estimate of what revenues and costs should have been, given the actual level of activity during the period. The flexible budget can be compared to the budget from the beginning of the period or to actual results.

LO2 Prepare a report showing activity variances.

When the flexible budget is compared to the budget from the beginning of the period, the result is an activity variance. An activity variance shows how a revenue or cost should have changed in response to the difference between budgeted and actual activity.

LO3 Prepare a report showing revenue and spending variances.

When the flexible budget is compared to actual results, revenue and spending variances are the result. A favorable revenue variance indicates that revenue was larger than should have been expected, given the actual level of activity. An unfavorable revenue variance indicates that revenue was less than it should have been, given the actual level of activity. A favorable spending variance indicates that the cost was less than expected, given the actual level of activity. An unfavorable spending variance indicates that the cost was greater than expected, given the actual level of activity.

LO4 Prepare a performance report that combines activity variances and revenue and spending variances.

A flexible budget performance report combines activity variances and revenue and spending variances in one report.

LO5 Prepare a flexible budget with more than one cost driver.

A cost may depend on more than one cost driver. If so, the flexible budget for that cost should be stated in terms of all of the cost drivers.

LO6 Understand common errors made in preparing performance reports based on budgets and actual results.

Common errors are to assume that all costs are variable or that all costs are fixed. If all costs are assumed to be fixed, the variances for variable and mixed costs will be incorrect. If all costs are assumed to be variable, the variances for fixed and mixed costs will be incorrect. The variance for a cost will be correct only if the actual behavior of the cost is correctly reflected in the flexible budget.

GUIDANCE ANSWERS TO DECISION MAKER AND YOU DECIDE

Owner of Micro-Brewery (p. 367)

The cost of hops is a purely variable cost. Since the cost for producing 800 barrels of beer is \$960, the cost of hops in one barrel of beer is \$1.20 ($= \$960 \div 800$ barrels). Therefore, if 850 barrels of beer are produced, the cost of the hops should be \$1.20 per barrel times 850 barrels, or \$1,020. Since that is how much was actually spent, there is no indication that too much or too little was spent on hops.

General Manager of a Luxury Resort (p. 370)

The budget specified revenue of \$2,362,500 for 5,625 room-days. Therefore, the budgeted revenue per room-day was \$420 ($= \$2,362,500 \div 5,625$ room-days) and the flexible budget for the actual level of activity was \$2,625,000 ($= \420 per room-day \times 6,250 room-days). Consequently, the activity variance was \$262,500 favorable ($= \$2,625,000 - \$2,362,500$) and the revenue variance was \$122,200 unfavorable ($= \$2,502,800 - \$2,625,000$). Apparently the resort discounted the room rates to get higher volume. This may or may not have been a good idea—depending on the effect on overall profit.

GUIDANCE ANSWERS TO CONCEPT CHECKS

1. **Choice c.** A flexible budget is useful for controlling variable costs.
2. **Choice c.** The variable cost is 30% of \$100,000, or \$30,000. The variable cost per unit is \$30,000 divided by 10,000 units, or \$3.00 per unit. The fixed cost is 70% of \$100,000, or \$70,000. Therefore, the flexible budget for 12,000 units would be \$106,000 ($= 12,000$ units \times \$3.00 per unit $+ \$70,000$).
3. **Choice b.** The cost for flowers according to the flexible budget is \$65,046 ($= \325 per operating day \times 30 operating days $+ \$7.20$ per room-day \times 7,680 room-days).
4. **Choice a.** The spending variance is \$3,068 favorable ($= \$65,046 - \$61,978$).



REVIEW PROBLEM: VARIANCE ANALYSIS USING A FLEXIBLE BUDGET

Harrald's Fish House is a family-owned restaurant that specializes in Scandinavian-style seafood. Data concerning the restaurant's monthly revenues and costs appear below (q refers to the number of meals served):

	Formula
Revenue.....	\$16.50 q
Cost of ingredients.....	\$6.25 q
Wages and salaries.....	\$10,400
Utilities.....	\$800 + \$0.20 q
Rent.....	\$2,200
Miscellaneous.....	\$600 + \$0.80 q

Required:

1. Prepare the restaurant's planning budget for April assuming that 1,800 meals are served.
2. Assume that 1,700 meals were actually served in April. Prepare a flexible budget for this level of activity.
3. The actual results for April appear below. Prepare a flexible budget performance report for the restaurant for April.

Revenue.....	\$27,920
Cost of ingredients.....	\$11,110
Wages and salaries.....	\$10,130
Utilities.....	\$1,080
Rent.....	\$2,200
Miscellaneous.....	\$2,240

Solution to Review Problem

1. The planning budget for April appears below:

Harrald's Fish House Planning Budget For the Month Ended April 30	
Budgeted meals served (q).....	1,800
Revenue (\$16.50 q).....	\$29,700
Expenses:	
Cost of ingredients (\$6.25 q).....	11,250
Wages and salaries (\$10,400).....	10,400
Utilities (\$800 + \$0.20 q).....	1,160
Rent (\$2,200).....	2,200
Miscellaneous (\$600 + \$0.80 q).....	2,040
Total expense.....	27,050
Net operating income.....	<u>\$ 2,650</u>

2. The flexible budget for April appears below:

Harrald's Fish House Flexible Budget For the Month Ended April 30	
Actual meals served (q)	1,700
Revenue (\$16.50q).....	<u>\$28,050</u>
Expenses:	
Cost of ingredients (\$6.25q)	10,625
Wages and salaries (\$10,400).....	10,400
Utilities (\$800 + \$0.20q).....	1,140
Rent (\$2,200).....	2,200
Miscellaneous (\$600 + \$0.80q).....	<u>1,960</u>
Total expense.....	<u>26,325</u>
Net operating income	<u>\$ 1,725</u>

3. The flexible budget performance report for April appears below:

Harrald's Fish House Flexible Budget Performance Report For the Month Ended April 30					
	(1) Planning Budget	Activity Variances (2) – (1)	(2) Flexible Budget	Revenue and Spending Variances (3) – (2)	(3) Actual Results
Meals served	1,800		1,700		1,700
Revenue (\$16.50q).....	<u>\$29,700</u>	<u>\$1,650</u> U	<u>\$28,050</u>	<u>\$130</u> U	<u>\$27,920</u>
Expenses:.....					
Cost of ingredients (\$6.25q)	11,250	625 F	10,625	485 U	11,110
Wages and salaries (\$10,400) ...	10,400	0	10,400	270 F	10,130
Utilities (\$800 + \$0.20q).....	1,160	20 F	1,140	60 F	1,080
Rent (\$2,200)	2,200	0	2,200	0	2,200
Miscellaneous (\$600 + \$0.80q)	<u>2,040</u>	<u>80</u> F	<u>1,960</u>	<u>280</u> U	<u>2,240</u>
Total expense.....	<u>27,050</u>	<u>725</u> F	<u>26,325</u>	<u>435</u> U	<u>26,760</u>
Net operating income	<u>\$ 2,650</u>	<u>\$ 925</u> U	<u>\$ 1,725</u>	<u>\$565</u> U	<u>\$ 1,160</u>

GLOSSARY

- Activity variance** The difference between a revenue or cost item in the static planning budget and the same item in the flexible budget. An activity variance is due solely to the difference between the level of activity assumed in the planning budget and the actual level of activity used in the flexible budget. (p. 365)
- Flexible budget** A report showing estimates of what revenues and costs should have been, given the actual level of activity for the period. (p. 360)
- Planning budget** A budget created at the beginning of the budgeting period that is valid only for the planned level of activity. (p. 360)
- Revenue variance** The difference between how much the revenue should have been, given the actual level of activity, and the actual revenue for the period. A favorable (unfavorable) revenue variance occurs because the revenue is higher (lower) than expected, given the actual level of activity for the period. (p. 366)

Spending variance The difference between how much a cost should have been, given the actual level of activity, and the actual amount of the cost. A favorable (unfavorable) spending variance occurs because the cost is lower (higher) than expected, given the actual level of activity for the period. (p. 366)

QUESTIONS

- 8-1 What is a static planning budget?
- 8-2 What is a flexible budget and how does it differ from a static planning budget?
- 8-3 What are some of the possible reasons that actual results may differ from what had been budgeted at the beginning of a period?
- 8-4 Why is it difficult to interpret a difference between how much expense was budgeted and how much was actually spent?
- 8-5 What is an activity variance and what does it mean?
- 8-6 What is a revenue variance and what does it mean?
- 8-7 What is a spending variance and what does it mean?
- 8-8 What does a flexible budget performance report do that a simple comparison of budgeted to actual results does not do?
- 8-9 How does a flexible budget based on two cost drivers differ from a flexible budget based on a single cost driver?
- 8-10 What assumption is implicitly made about cost behavior when a budget is directly compared to actual results? Why is this assumption questionable?
- 8-11 What assumption is implicitly made about cost behavior when all of the items in a budget are adjusted in proportion to a change in activity? Why is this assumption questionable?



Multiple-choice questions are provided on the text website at www.mhhe.com/brewer5e.

BRIEF EXERCISES

connect



BRIEF EXERCISE 8-1 Prepare a Flexible Budget [LO1]

Puget Sound Divers is a company that provides diving services such as underwater ship repairs to clients in the Puget Sound area. The company's planning budget for May appears below:

Puget Sound Divers Planning Budget For the Month Ended May 31	
Budgeted diving-hours (q)	100
Revenue ($\$365.00q$).....	<u>\\$36,500</u>
Expenses:	
Wages and salaries ($\$8,000 + \$125.00q$).....	20,500
Supplies ($\$3.00q$).....	300
Equipment rental ($\$1,800 + \$32.00q$)	5,000
Insurance ($\$3,400$).....	3,400
Miscellaneous ($\$630 + \$1.80q$).....	<u>810</u>
Total expense.....	<u>30,010</u>
Net operating income	<u><u>\\$ 6,490</u></u>

Required:

During May, the company's activity was actually 105 diving-hours. Prepare a flexible budget for that level of activity.



BRIEF EXERCISE 8-2 Prepare a Report Showing Activity Variances [LO2]

Flight Café is a company that prepares in-flight meals for airlines in its kitchen located next to the local airport. The company's planning budget for July follows:

Flight Café Planning Budget For the Month Ended July 31	
Budgeted meals (q)	18,000
Revenue (\$4.50q)	<u>\$81,000</u>
Expenses:	
Raw materials (\$2.40q)	43,200
Wages and salaries (\$5,200 + \$0.30q)	10,600
Utilities (\$2,400 + \$0.05q)	3,300
Facility rent (\$4,300)	4,300
Insurance (\$2,300)	2,300
Miscellaneous (\$680 + \$0.10q)	<u>2,480</u>
Total expense	66,180
Net operating income	<u>\$14,820</u>

In July, 17,800 meals were actually served. The company's flexible budget for this level of activity appears below:

Flight Café Flexible Budget For the Month Ended July 31	
Budgeted meals (q)	17,800
Revenue (\$4.50q)	<u>\$80,100</u>
Expenses:	
Raw materials (\$2.40q)	42,720
Wages and salaries (\$5,200 + \$0.30q)	10,540
Utilities (\$2,400 + \$0.05q)	3,290
Facility rent (\$4,300)	4,300
Insurance (\$2,300)	2,300
Miscellaneous (\$680 + \$0.10q)	<u>2,460</u>
Total expense	65,610
Net operating income	<u>\$14,490</u>

Required:

1. Prepare a report showing the company's activity variances for July.
2. Which of the activity variances should be of concern to management? Explain.

BRIEF EXERCISE 8-3 Prepare a Report Showing Revenue and Spending Variances [LO3]

Quilcene Oysteria farms and sells oysters in the Pacific Northwest. The company harvested and sold 8,000 pounds of oysters in August. The company's flexible budget for August appears below:



Quilcene Oysteria Flexible Budget For the Month Ended August 31	
Actual pounds (q)	8,000
Revenue (\$4.00q)	<u>\$32,000</u>
Expenses:	
Packing supplies (\$0.50q)	4,000
Oyster bed maintenance (\$3,200)	3,200
Wages and salaries (\$2,900 + \$0.30q)	5,300
Shipping (\$0.80q)	6,400
Utilities (\$830)	830
Other (\$450 + \$0.05q)	<u>850</u>
Total expense	20,580
Net operating income	<u>\$11,420</u>

The actual results for August appear below:

Quilcene Oysteria Income Statement For the Month Ended August 31	
Actual pounds.....	8,000
Revenue	<u>\$35,200</u>
Expenses:	
Packing supplies	4,200
Oyster bed maintenance.....	3,100
Wages and salaries	5,640
Shipping.....	6,950
Utilities	810
Other.....	<u>980</u>
Total expense.....	21,680
Net operating income	<u>\$13,520</u>

Required:

Prepare a report showing the company's revenue and spending variances for August.



BRIEF EXERCISE 8-4 Prepare a Flexible Budget Performance Report [LO4]

Vulcan Flyovers offers scenic overflights of Mount St. Helens, the volcano in Washington State that explosively erupted in 1982. Data concerning the company's operations in July appear below:

Vulcan Flyovers Operating Data For the Month Ended July 31			
	Planning Budget	Flexible Budget	Actual Results
Flights (q)	50	48	48
Revenue (\$320.00q).....	<u>\$16,000</u>	<u>\$15,360</u>	<u>\$13,650</u>
Expenses:			
Wages and salaries (\$4,000 + \$82.00q).....	8,100	7,936	8,430
Fuel (\$23.00q)	1,150	1,104	1,260
Airport fees (\$650 + \$38.00q)	2,550	2,474	2,350
Aircraft depreciation (\$7.00q)	350	336	336
Office expenses (\$190 + \$2.00q).....	290	286	460
Total expense	<u>12,440</u>	<u>12,136</u>	<u>12,836</u>
Net operating income	<u>\$ 3,560</u>	<u>\$ 3,224</u>	<u>\$ 814</u>

The company measures its activity in terms of flights. Customers can buy individual tickets for overflights or hire an entire plane for an overflight at a discount.

Required:

1. Prepare a flexible budget performance report for July.
2. Which of the variances should be of concern to management? Explain.



BRIEF EXERCISE 8-5 Prepare a Flexible Budget with More than One Cost Driver [LO5]

Alyeski Tours operates day tours of coastal glaciers in Alaska on its tour boat the Blue Glacier. Management has identified two cost drivers—the number of cruises and the number of passengers—that it uses in its budgeting and performance reports. The company publishes a schedule of day cruises that it may

supplement with special sailings if there is sufficient demand. Up to 80 passengers can be accommodated on the tour boat. Data concerning the company's cost formulas appear below:

	Fixed Cost per Month	Cost per Cruise	Cost per Passenger
Vessel operating costs	\$5,200	\$480.00	\$2.00
Advertising.....	\$1,700		
Administrative costs.....	\$4,300	\$24.00	\$1.00
Insurance.....	\$2,900		

For example, vessel operating costs should be \$5,200 per month plus \$480 per cruise plus \$2 per passenger. The company's sales should average \$25 per passenger. The company's planning budget for July is based on 24 cruises and 1,400 passengers.

Required:

Prepare the company's planning budget for July.

BRIEF EXERCISE 8-6 Critique a Variance Report [LO6]

The Terminator Inc. provides on-site residential pest extermination services. The company has several mobile teams who are dispatched from a central location in company-owned trucks. The company uses the number of jobs to measure activity. At the beginning of April, the company budgeted for 100 jobs, but the actual number of jobs turned out to be 105. A report comparing the budgeted revenues and costs to the actual revenues and costs appears below:



The Terminator Inc. Variance Report For the Month Ended April 30			
	Planning Budget	Actual Results	Variances
Jobs	100	105	
Revenue.....	\$19,500	\$20,520	\$1,020 F
Expenses:			
Mobile team operating costs	10,000	10,320	320 U
Exterminating supplies	1,800	960	840 F
Advertising.....	800	800	0
Dispatching costs	2,200	2,340	140 U
Office rent.....	1,800	1,800	0
Insurance.....	2,100	2,100	0
Total expense	18,700	18,320	380 F
Net operating income.....	\$ 800	\$ 2,200	\$1,400 F

Required:

Is the above variance report useful for evaluating how well revenues and costs were controlled during April? Why, or why not?

BRIEF EXERCISE 8-7 Critique a Variance Report [LO6]

Refer to the data for The Terminator Inc. in Brief Exercise 8-6. A management intern has suggested that the budgeted revenues and costs should be adjusted for the actual level of activity in April before they are compared to the actual revenues and costs. Because the actual level of activity was 5% higher than budgeted, the intern suggested that all budgeted revenues and costs should be adjusted upward by 5%. A report comparing the budgeted revenues and costs, with this adjustment, to the actual revenues and costs appears on the following page.



The Terminator Inc.			
Variance Report			
For the Month Ended April 30			
	Adjusted Planning Budget	Actual Results	Variations
Jobs	105	105	
Revenue	\$20,475	\$20,520	\$ 45 F
Expenses:			
Mobile team operating costs	10,500	10,320	180 F
Exterminating supplies	1,890	960	930 F
Advertising	840	800	40 F
Dispatching costs	2,310	2,340	30 U
Office rent	1,890	1,800	90 F
Insurance	2,205	2,100	105 F
Total expense	19,635	18,320	1,315 F
Net operating income	\$ 840	\$ 2,200	\$1,360 F

Required:

Is the above variance report useful for evaluating how well revenues and costs were controlled during April? Why, or why not?

EXERCISES**connect****EXERCISE 8-8 Flexible Budget [LO1]**

Lavage Rapide is a Canadian company that owns and operates a large automatic carwash facility near Montreal. The following table provides data concerning the company's costs:

	Fixed Cost per Month	Cost per Car Washed
Cleaning supplies		\$0.80
Electricity	\$1,200	\$0.15
Maintenance		\$0.20
Wages and salaries	\$5,000	\$0.30
Depreciation	\$6,000	
Rent	\$8,000	
Administrative expenses	\$4,000	\$0.10

For example, electricity costs are \$1,200 per month plus \$0.15 per car washed. The company expects to wash 9,000 cars in August and to collect an average of \$4.90 per car washed.

Required:

Prepare the company's planning budget for August.

**EXERCISE 8-9 Flexible Budget [LO1]**

Refer to the data for Lavage Rapide in Exercise 8-8. The company actually washed 8,800 cars in August.

Required:

Prepare the company's flexible budget for August.

EXERCISE 8-10 Prepare a Report Showing Activity Variances [LO2]

Refer to the data for Lavage Rapide in Exercise 8-8. The actual operating results for August appear below.



Lavage Rapide Income Statement For the Month Ended August 31	
Actual cars washed	8,800
Revenue	\$43,080
Expenses:	
Cleaning supplies.....	7,560
Electricity	2,670
Maintenance	2,260
Wages and salaries	8,500
Depreciation.....	6,000
Rent	8,000
Administrative expenses.....	4,950
Total expense	39,940
Net operating income	<u>\$ 3,140</u>

Required:

Prepare a report showing the company's activity variances for August.

EXERCISE 8-11 Prepare a Report Showing Revenue and Spending Variances [LO3]

Refer to the data for Lavage Rapide in Exercises 8-8 and 8-10.



Required:

Prepare a report showing the company's revenue and spending variances for August.

EXERCISE 8-12 Prepare a Flexible Budget Performance Report [LO4]

Refer to the data for Lavage Rapide in Exercises 8-8 and 8-10.



Required:

Prepare a flexible budget performance report that shows the company's activity variances and revenue and spending variances for August.

EXERCISE 8-13 Flexible Budget [LO1]

Wyckam Manufacturing Inc. has provided the following information concerning its manufacturing costs:

	Fixed Cost per Month	Cost per Machine-Hour
Direct materials		\$4.25
Direct labor	\$36,800	
Supplies.....		\$0.30
Utilities	\$1,400	\$0.05
Depreciation	\$16,700	
Insurance.....	\$12,700	

For example, utilities should be \$1,400 per month plus \$0.05 per machine-hour. The company expects to work 5,000 machine-hours in June. Note that the company's direct labor is a fixed cost.

Required:

Prepare the company's planning budget for manufacturing costs for June.

**EXERCISE 8-14 Flexible Budgets and Activity Variances [LO1, LO2]**

Jake's Roof Repair has provided the following data concerning its costs:

	Fixed Cost per Month	Cost per Repair-Hour
Wages and salaries	\$23,200	\$16.30
Parts and supplies		\$8.60
Equipment depreciation.....	\$1,600	\$0.40
Truck operating expenses	\$6,400	\$1.70
Rent	\$3,480	
Administrative expenses.....	\$4,500	\$0.80

For example, wages and salaries should be \$23,200 plus \$16.30 per repair-hour. The company expected to work 2,800 repair-hours in May, but actually worked 2,900 repair-hours. The company expects its sales to be \$44.50 per repair-hour.

Required:

Prepare a report showing the company's activity variances for May.

**EXERCISE 8-15 Flexible Budgets and Revenue and Spending Variances [LO1, LO3]**

Via Gelato is a popular neighborhood gelato shop. The company has provided the following data concerning its operations:

	Fixed Element per Month	Variable Element per Liter	Actual Total for June
Revenue.....		\$12.00	\$71,540
Raw materials		\$4.65	\$29,230
Wages.....	\$5,600	\$1.40	\$13,860
Utilities	\$1,630	\$0.20	\$3,270
Rent	\$2,600		\$2,600
Insurance	\$1,350		\$1,350
Miscellaneous	\$650	\$0.35	\$2,590

While gelato is sold by the cone or cup, the shop measures its activity in terms of the total number of liters of gelato sold. For example, wages should be \$5,600 plus \$1.40 per liter of gelato sold and the actual wages for June were \$13,860. Via Gelato expected to sell 6,000 liters in June, but actually sold 6,200 liters.

Required:

Prepare a report showing Via Gelato revenue and spending variances for June.

**EXERCISE 8-16 Flexible Budget Performance Report [LO1, LO4]**

AirQual Test Corporation provides on-site air quality testing services. The company has provided the following data concerning its operations:

	Fixed Component per Month	Variable Component per Job	Actual Total for February
Revenue.....		\$360	\$18,950
Technician wages	\$6,400		\$6,450
Mobile lab operating expenses	\$2,900	\$35	\$4,530
Office expenses	\$2,600	\$2	\$3,050
Advertising expenses.....	\$970		\$995
Insurance	\$1,680		\$1,680
Miscellaneous expenses.....	\$500	\$3	\$465

The company uses the number of jobs as its measure of activity. For example, mobile lab operating expenses should be \$2,900 plus \$35 per job, and the actual mobile lab operating expenses for February were \$4,530.

The company expected to work 50 jobs in February, but actually worked 52 jobs.

Required:

Prepare a flexible budget performance report showing AirQual Test Corporation's activity variances and revenue and spending variances for February.

EXERCISE 8-17 Working with More than One Cost Driver [LO4, LOS]

The Gourmand Cooking School runs short cooking courses at its small campus. Management has identified two cost drivers that it uses in its budgeting and performance reports—the number of courses and the total number of students. For example, the school might run two courses in a month and have a total of 50 students enrolled in those two courses. Data concerning the company's cost formulas appear below:



	Fixed Cost per Month	Cost per Course	Cost per Student
Instructor wages		\$3,080	
Classroom supplies			\$260
Utilities	\$870	\$130	
Campus rent	\$4,200		
Insurance	\$1,890		
Administrative expenses	\$3,270	\$15	\$4

For example, administrative expenses should be \$3,270 per month plus \$15 per course plus \$4 per student. The company's sales should average \$800 per student.

The actual operating results for September appear below:

	Actual
Revenue	\$32,400
Instructor wages	\$9,080
Classroom supplies	\$8,540
Utilities	\$1,530
Campus rent	\$4,200
Insurance	\$1,890
Administrative expenses	\$3,790

Required:

1. The Gourmand Cooking School expects to run three courses with a total of 45 students in September. Prepare the company's planning budget for this level of activity.
2. The school actually ran three courses with a total of 42 students in September. Prepare the company's flexible budget for this level of activity.
3. Prepare a flexible budget performance report that shows both activity variances and revenue and spending variances for September.

EXERCISE 8-18 Flexible Budget Performance Report in a Cost Center [LO1, LO4]

Packaging Solutions Corporation manufactures and sells a wide variety of packaging products. Performance reports are prepared monthly for each department. The planning budget and flexible budget for the Production Department are based on the following formulas, where q is the number of labor-hours worked in a month:



	Cost Formulas
Direct labor	\$15.80 q
Indirect labor	\$8,200 + \$1.60 q
Utilities	\$6,400 + \$0.80 q
Supplies	\$1,100 + \$0.40 q
Equipment depreciation	\$23,000 + \$3.70 q
Factory rent	\$8,400
Property taxes	\$2,100
Factory administration	\$11,700 + \$1.90 q

The actual costs incurred in March in the Production Department are listed below:

	Actual Cost Incurred in March
Direct labor	\$134,730
Indirect labor.....	\$19,860
Utilities	\$14,570
Supplies	\$4,980
Equipment depreciation.....	\$54,080
Factory rent	\$8,700
Property taxes	\$2,100
Factory administration	\$26,470

Required:

1. The company had budgeted for an activity level of 8,000 labor-hours in March. Prepare the Production Department's planning budget for the month.
2. The company actually worked 8,400 labor-hours in March. Prepare the Production Department's flexible budget for the month.
3. Prepare the Production Department's flexible budget performance report for March, including both the activity and spending variances.
4. What aspects of the flexible budget performance report should be brought to management's attention? Explain.

PROBLEMS

connect

Alternate problem set is available on the text website.

CHECK FIGURE

- (2) Overall activity variance: \$435 F



PROBLEM 8-19A Critique a Report; Prepare a Performance Report [LO1, LO4, LO6]

TipTop Flight School offers flying lessons at a small municipal airport. The school's owner and manager has been attempting to evaluate performance and control costs using a variance report that compares the planning budget to actual results. A recent variance report appears below:

TipTop Flight School Variance Report For the Month Ended July 31			
	Planning Budget	Actual Results	Variances
Lessons	150	155	
Revenue	\$33,000	\$33,900	\$900 F
Expenses:			
Instructor wages.....	9,750	9,870	120 U
Aircraft depreciation.....	5,700	5,890	190 U
Fuel	2,250	2,750	500 U
Maintenance	2,330	2,450	120 U
Ground facility expenses...	1,550	1,540	10 F
Administration	3,390	3,320	70 F
Total expense	24,970	25,820	850 U
Net operating income	\$ 8,030	\$ 8,080	\$ 50 F

After several months of using such variance reports, the owner has become frustrated. For example, she is quite confident that instructor wages were very tightly controlled in July, but the report shows an unfavorable variance.

The planning budget was developed using the following formulas, where q is the number of lessons sold:

Cost Formulas	
Revenue	$\$220q$
Instructor wages	$\$65q$
Aircraft depreciation.....	$\$38q$
Fuel	$\$15q$
Maintenance	$\$530 + \$12q$
Ground facility expenses	$\$1,250 + \$2q$
Administration.....	$\$3,240 + \$1q$

Required:

1. Should the owner feel frustrated with the variance reports? Explain.
2. Prepare a flexible budget performance report for the school for July.
3. Evaluate the school's performance for July.

PROBLEM 8-20A Performance Report for a Non-Profit Organization [LO1, LO4, LO6]

The St. Lucia Blood Bank, a private charity partly supported by government grants, is located on the Caribbean island of St. Lucia. The blood bank has just finished its operations for September, which was a particularly busy month due to a powerful hurricane that hit neighboring islands causing many injuries. The hurricane largely bypassed St. Lucia, but residents of St. Lucia willingly donated their blood to help people on other islands. As a consequence, the blood bank collected and processed over 20% more blood than had been originally planned for the month.

A report prepared by a government official comparing actual costs to budgeted costs for the blood bank appears below. (The currency on St. Lucia is the East Caribbean dollar.) Continued support from the government depends on the blood bank's ability to demonstrate control over its costs.

CHECK FIGURE

- (1) Flexible budget total expense: \$32,290



St. Lucia Blood Bank Cost Control Report For the Month Ended September 30			
	Planning Budget	Actual Results	Variiances
Liters of blood collected.....	500	620	
Medical supplies	\$ 7,500	\$ 9,250	\$1,750 U
Lab tests	6,000	6,180	180 U
Equipment depreciation.....	2,500	2,800	300 U
Rent.....	1,000	1,000	0
Utilities	500	570	70 U
Administration	11,250	11,740	490 U
Total expense.....	<u>\$28,750</u>	<u>\$31,540</u>	<u>\$2,790 U</u>

The managing director of the blood bank was very unhappy with this report, claiming that his costs were higher than expected due to the emergency on the neighboring islands. He also pointed out that the additional costs had been fully covered by payments from grateful recipients on the other islands. The government official who prepared the report countered that all of the figures had been submitted by the blood bank to the government; he was just pointing out that actual costs were a lot higher than promised in the budget.

The following cost formulas were used to construct the planning budget:

Cost Formulas	
Medical supplies	\$15.00q
Lab tests	\$12.00q
Equipment depreciation	\$2,500
Rent	\$1,000
Utilities	\$500
Administration	\$10,000 + \$2.50q

Required:

1. Prepare a new performance report for September using the flexible budget approach.
2. Do you think any of the variances in the report you prepared should be investigated? Why?

CHECK FIGURE

- (3) Overall spending variance: \$5,700 U



PROBLEM 8-21A Critiquing a Variance Report; Preparing a Performance Report [LO1, LO4, LO6]

Several years ago, Westmont Corporation developed a comprehensive budgeting system for profit planning and control purposes. While departmental supervisors have been happy with the system, the factory manager has expressed considerable dissatisfaction with the information being generated by the system.

A typical departmental cost report for a recent period follows:

Assembly Department Cost Report For the Month Ended March 31				
	Planning Budget	Actual Results	Variances	
Machine-hours	40,000	35,000		
Variable costs:				
Supplies	\$ 32,000	\$ 29,700	\$ 2,300	F
Scrap	20,000	19,500	500	F
Indirect materials	56,000	51,800	4,200	F
Fixed costs:				
Wages and salaries	80,000	79,200	800	F
Equipment depreciation	60,000	60,000	-	
Total cost	\$248,000	\$ 240,200	\$ 7,800	F

After receiving a copy of this cost report, the supervisor of the Assembly Department stated, "These reports are super. It makes me feel really good to see how well things are going in my department. I can't understand why those people upstairs complain so much about the reports."

For the last several years, the company's marketing department has chronically failed to meet the sales goals expressed in the company's monthly budgets.

Required:

1. The company's president is uneasy about the cost reports and would like you to evaluate their usefulness to the company.
2. What changes, if any, should be made in the reports to give better insight into how well departmental supervisors are controlling costs?

3. Prepare a new performance report for the quarter, incorporating any changes you suggested in question (2) on the prior page.
4. How well were costs controlled in the Assembly Department in March?

PROBLEM 8-22A More than One Cost Driver [LO4, LOS]

Milano Pizza is a small neighborhood pizzeria that has a small area for in-store dining as well as offering take-out and free home delivery services. The pizzeria’s owner has determined that the shop has two major cost drivers—the number of pizzas sold and the number of deliveries made. Data concerning the pizzeria’s costs appear below:

	Fixed Cost per Month	Cost per Pizza	Cost per Delivery
Pizza ingredients		\$3.80	
Kitchen staff.....	\$5,220		
Utilities	\$630	\$0.05	
Delivery person.....			\$3.50
Delivery vehicle	\$540		\$1.50
Equipment depreciation.....	\$275		
Rent.....	\$1,830		
Miscellaneous.....	\$820	\$0.15	

CHECK FIGURE

(1) Overall activity variance: \$410 F



In November, the pizzeria budgeted for 1,200 pizzas at an average selling price of \$13.50 per pizza and for 180 deliveries.

Data concerning the pizzeria’s operations in November appear below:

	Actual Results
Pizzas	1,240
Deliveries.....	174
Revenue	\$17,420
Pizza ingredients	\$4,985
Kitchen staff.....	\$5,281
Utilities	\$984
Delivery person	\$609
Delivery vehicle	\$655
Equipment depreciation.....	\$275
Rent.....	\$1,830
Miscellaneous	\$954

Required:

1. Prepare a flexible budget performance report that shows both activity variances and revenue and spending variances for the pizzeria for November.
2. Explain the activity variances.

PROBLEM 8-23A Activity and Spending Variances [LO1, LO2, LO3]

You have just been hired by FAB Corporation, the manufacturer of a revolutionary new garage door opening device. The president has asked that you review the company’s costing system and “do what you can to help us get better control of our manufacturing overhead costs.” You find that the company has never used a flexible budget, and you suggest that preparing such a budget would be an excellent first step in overhead planning and control.

CHECK FIGURE

(2) Overall spending variance: \$1,000 U



After much effort and analysis, you determined the following cost formulas and gathered the following actual cost data for March:

	Cost Formula	Actual Cost in March
Utilities	\$20,600 plus \$0.10 per machine-hour	\$24,200
Maintenance	\$40,000 plus \$1.60 per machine-hour	\$78,100
Supplies	\$0.30 per machine-hour	\$8,400
Indirect labor	\$130,000 plus \$0.70 per machine-hour	\$149,600
Depreciation	\$70,000	\$71,500

During March, the company worked 26,000 machine-hours and produced 15,000 units. The company had originally planned to work 30,000 machine-hours during March.

Required:

1. Prepare a report showing the activity variances for March. Explain what these variances mean.
2. Prepare a report showing the spending variances for March. Explain what these variances mean.

CHECK FIGURE

- (2) Overall spending variance: \$1,100 F

PROBLEM 8-24A Critiquing a Cost Report; Preparing a Performance Report [LO1, LO4, LO6]

Frank Weston, supervisor of the Fremont Corporation's Machining Department, was visibly upset after being reprimanded for his department's poor performance over the prior month. The department's cost control report is given below:

excel



Freemont Corporation—Machining Department Cost Control Report For the Month Ended June 30			
	Planning Budget	Actual Results	Variances
Machine-hours	35,000	38,000	
Direct labor wages	\$ 80,500	\$ 86,100	\$ 5,600 U
Supplies	21,000	23,100	2,100 U
Maintenance	134,000	137,300	3,300 U
Utilities	15,200	15,700	500 U
Supervision	38,000	38,000	0
Depreciation	80,000	80,000	0
Total	<u>\$368,700</u>	<u>\$380,200</u>	<u>\$11,500 U</u>

"I just can't understand all the red ink," Weston complained to the supervisor of another department. "When the boss called me in, I thought he was going to give me a pat on the back because I know for a fact that my department worked more efficiently last month than it has ever worked before. Instead, he tore me apart. I thought for a minute that it might be over the supplies that were stolen out of our warehouse last month. But they only amounted to a couple of hundred dollars, and just look at this report. Everything is unfavorable."

Direct labor wages and supplies are variable costs; supervision and depreciation are fixed costs; and maintenance and utilities are mixed costs. The fixed component of the budgeted maintenance cost is \$92,000; the fixed component of the budgeted utilities cost is \$11,700.

Required:

1. Evaluate the company's cost control report and explain why the variances were all unfavorable.
2. Prepare a performance report that will help Mr. Weston's superiors assess how well costs were controlled in the Machining Department.

PROBLEM 8–25A Critiquing a Report; Preparing a Performance Budget [LO1, LO4, LO6]

Exchange Corp. is a company that acts as a facilitator in tax-favored real estate swaps. Such swaps, known as 1031 exchanges, permit participants to avoid some or all of the capital gains taxes that would otherwise be due. The bookkeeper for the company has been asked to prepare a report for the company to help its owner/manager analyze performance. The first such report appears below:

Exchange Corp. Analysis of Revenues and Costs For the Month Ended May 31			
	Planning Budget Unit Revenues and Costs	Actual Unit Revenues and Costs	Variances
Exchanges completed	40	50	
Revenue	\$395	\$385	\$10 U
Expenses:			
Legal and search fees.....	165	184	19 U
Office expenses	135	112	23 F
Equipment depreciation	10	8	2 F
Rent	45	36	9 F
Insurance	5	4	1 F
Total expense.....	<u>360</u>	<u>344</u>	<u>16 F</u>
Net operating income	<u>\$ 35</u>	<u>\$ 41</u>	<u>\$ 6 F</u>

Note that the revenues and costs in the above report are *unit* revenues and costs. For example, the average office expense is \$135 per exchange completed on the planning budget; whereas, the average actual office expense is \$112 per exchange completed.

Legal and search fees is a variable cost; office expenses is a mixed cost; and equipment depreciation, rent, and insurance are fixed costs. In the planning budget, the fixed component of office expenses was \$5,200.

All of the company's revenues come from fees collected when an exchange is completed.

Required:

1. Evaluate the report prepared by the bookkeeper.
2. Prepare a performance report that would help the owner/manager assess the performance of the company in May.
3. Using the report you created, evaluate the performance of the company in May.

CHECK FIGURE

- (2) Overall activity variance: \$2,250 F

**BUILDING YOUR SKILLS****CASE [LO4, LO5]**

The Little Theatre is a nonprofit organization devoted to staging plays for children. The theater has a very small full-time professional administrative staff. Through a special arrangement with the actors' union, actors and directors rehearse without pay and are paid only for actual performances.

The costs from the current year's planning budget appear below. The Little Theatre had tentatively planned to put on six different productions with a total of 108 performances. For example, one of the productions was *Peter Rabbit*, which had a six-week run with three performances on each weekend.

CHECK FIGURE

- (2) Flexible budget total expense: \$724,280



The Little Theatre
Costs from the Planning Budget
For the Year Ended December 31

Budgeted number of productions	6
Budgeted number of performances.....	108
Actors' and directors' wages.....	\$216,000
Stagehands' wages	32,400
Ticket booth personnel and ushers' wages	16,200
Scenery, costumes, and props	108,000
Theater hall rent	54,000
Printed programs.....	27,000
Publicity	12,000
Administrative expenses.....	43,200
Total.....	<u>\$508,800</u>

Some of the costs vary with the number of productions, some with the number of performances, and some are fixed and depend on neither the number of productions nor the number of performances. The costs of scenery, costumes, props, and publicity vary with the number of productions. It doesn't make any difference how many times *Peter Rabbit* is performed, the cost of the scenery is the same. Likewise, the cost of publicizing a play with posters and radio commercials is the same whether there are 10, 20, or 30 performances of the play. On the other hand, the wages of the actors, directors, stagehands, ticket booth personnel, and ushers vary with the number of performances. The greater the number of performances, the higher the wage costs will be. Similarly, the costs of renting the hall and printing the programs will vary with the number of performances. Administrative expenses are more difficult to pin down, but the best estimate is that approximately 75% of the budgeted costs are fixed, 15% depend on the number of productions staged, and the remaining 10% depend on the number of performances.

After the beginning of the year, the board of directors of the theater authorized expanding the theater's program to seven productions and a total of 168 performances. Not surprisingly, actual costs were considerably higher than the costs from the planning budget. (Grants from donors and ticket sales were also correspondingly higher, but are not shown here.) Data concerning the actual costs appear below:

The Little Theatre
Actual Costs
For the Year Ended December 31

Actual number of productions	7
Actual number of performances	168
Actors' and directors' wages.....	\$341,800
Stagehands' wages	49,700
Ticket booth personnel and ushers' wages	25,900
Scenery, costumes, and props	130,600
Theater hall rent	78,000
Printed programs.....	38,300
Publicity	15,100
Administrative expenses.....	47,500
Total.....	<u>\$726,900</u>

Required:

1. Prepare a flexible budget for The Little Theatre based on the actual activity of the year.
2. Prepare a flexible budget performance report for the year that shows both activity variances and spending variances.

- If you were on the board of directors of the theater, would you be pleased with how well costs were controlled during the year? Why, or why not?
- The cost formulas provide figures for the average cost per production and average cost per performance. How accurate do you think these figures would be for predicting the cost of a new production or of an additional performance of a particular production?

ETHICS CASE [LO3]

Tom Kemper is the controller of the Wichita manufacturing facility of Prudhom Enterprises, Inc. The annual cost control report is one of the many reports that must be filed with corporate headquarters and is due at corporate headquarters shortly after the beginning of the New Year. Kemper does not like putting work off to the last minute, so just before Christmas he prepared a preliminary draft of the cost control report. Some adjustments would later be required for transactions that occur between Christmas and New Year's Day. A copy of the preliminary draft report, which Kemper completed on December 21, follows:



Wichita Manufacturing Facility Cost Control Report December 21 Preliminary Draft			
	Flexible Budget	Actual Results	Spending Variances
Labor-hours	18,000	18,000	
Direct labor	\$ 324,000	\$ 326,000	\$ 2,000 U
Power	18,000	19,750	1,750 U
Supplies.....	99,000	105,000	6,000 U
Equipment depreciation....	332,000	343,000	11,000 U
Supervisory salaries	275,000	273,000	2,000 F
Insurance.....	37,000	37,000	0
Industrial engineering	210,000	189,000	21,000 F
Factory building lease.....	60,000	60,000	0
Total expense	<u>\$1,355,000</u>	<u>\$1,352,750</u>	<u>\$ 2,250 F</u>

Melissa Ilianovitch, the general manager at the Wichita facility, asked to see a copy of the preliminary draft report. Kemper carried a copy of the report to her office where the following discussion took place:

Ilianovitch: Ouch! Almost all of the variances on the report are unfavorable. The only favorable variances are for supervisory salaries and industrial engineering. How did we have an unfavorable variance for depreciation?

Kemper: Do you remember that milling machine that broke down because the wrong lubricant was used by the machine operator?

Ilianovitch: Yes.

Kemper: We couldn't fix it. We had to scrap the machine and buy a new one.

Ilianovitch: This report doesn't look good. I was raked over the coals last year when we had just a few unfavorable variances.

Kemper: I'm afraid the final report is going to look even worse.

Ilianovitch: Oh?

Kemper: The line item for industrial engineering on the report is for work we hired Ferguson Engineering to do for us. The original contract was for \$210,000, but we asked them to do some additional work that was not in the contract. We have to reimburse Ferguson Engineering for the costs of that additional work. The \$189,000 in actual costs that appears on the preliminary draft report reflects only their billings up through December 21. The last bill they had sent us was on November 28, and they completed the project just last week. Yesterday I got a call from Laura Sunder over at Ferguson and she said they would be sending us a final bill for the project before the end of the year. The total bill, including the reimbursements for the additional work, is going to be . . .

Ilianovitch: I am not sure I want to hear this.

Kemper: \$225,000

Ilianovitch: Ouch!

Kemper: The additional work added \$15,000 to the cost of the project.

Ilianovitch: I can't turn in a report with an overall unfavorable variance! They'll kill me at corporate headquarters. Call up Laura at Ferguson and ask her not to send the bill until after the first of the year. We have to have that \$21,000 favorable variance for industrial engineering on the report.

Required:

What should Tom Kemper do? Explain.

ANALYTICAL THINKING [LO3, LO5, LO6]

Boync University offers an extensive continuing education program in many cities throughout the state. For the convenience of its faculty and administrative staff and to save costs, the university operates a motor pool. The motor pool operated with 20 vehicles until February, when an additional automobile was acquired at the request of the university administration. The motor pool furnishes gasoline, oil, and other supplies for its automobiles. A mechanic does routine maintenance and minor repairs. Major repairs are performed at a nearby commercial garage. Each year, the supervisor of the motor pool prepares an annual budget, which is reviewed by the university and approved after suitable modifications.

The following cost control report shows actual operating costs for March of the current year compared to one-twelfth of the annual budget.

CHECK FIGURE

(1) Overall spending variance: \$395 F



Boync University Motor Pool Cost Control Report For the Month Ended March 31				
	Annual Budget	Monthly Budget (1/12 of Annual Budget)	March Actual	(Over) Under Budget
Miles	600,000	50,000	63,000	
Autos	20	20	21	
Gasoline	\$ 90,000	\$ 7,500	\$ 9,350	(\$1,850)
Oil, minor repairs, parts	24,000	2,000	2,360	(360)
Outside repairs	18,000	1,500	1,420	80
Insurance.....	24,000	2,000	2,120	(120)
Salaries and benefits.....	90,480	7,540	7,540	0
Vehicle depreciation	60,000	5,000	5,250	(250)
Total.....	<u>\$306,480</u>	<u>\$25,540</u>	<u>\$28,040</u>	<u>(\$2,500)</u>

The annual budget was based on the following assumptions:

- \$0.15 per mile for gasoline.
- \$0.04 per mile for oil, minor repairs, and parts.
- \$900 per automobile per year for outside repairs.
- \$1,200 per automobile per year for insurance.
- \$7,540 per month for salaries and benefits.
- \$3,000 per automobile per year for depreciation.

The supervisor of the motor pool is unhappy with the report, claiming it paints an unfair picture of the motor pool's performance.

Required:

- Prepare a new performance report for March based on a flexible budget that shows spending variances.
- What are the deficiencies in the original cost control report? How does the report that you prepared in part (1) above overcome these deficiencies?

(CMA, adapted)

9

Standard Costs

<< A LOOK BACK

In Chapter 8, we began the discussion of management control and performance measures. Flexible budgets, which estimate what costs and revenues should have been given the actual level of activity during the period, were used to analyze the results of operations. Flexible budgets were compared to planning budgets and to actual results.

A LOOK AT THIS CHAPTER

In Chapter 9, we look in greater detail at the spending variances introduced in Chapter 8. Standards are used to isolate the effects of various factors on actual results. In particular, we compute material, labor, and overhead variances.

A LOOK AHEAD >>

In Chapter 10, we continue the discussion of management control and performance measures by focusing on how decentralized organizations are managed.

CHAPTER OUTLINE

Standard Costs—Management by Exception

- Who Uses Standard Costs?

Setting Standard Costs

- Ideal versus Practical Standards
- Setting Direct Materials Standards
- Setting Direct Labor Standards
- Setting Variable Manufacturing Overhead Standards

A General Model for Variance Analysis

- Price and Quantity Variances

Using Standard Costs—Direct Materials Variances

- Materials Price Variance—A Closer Look
- Materials Quantity Variance—A Closer Look

Using Standard Costs—Direct Labor Variances

- Labor Rate Variance—A Closer Look
- Labor Efficiency Variance—A Closer Look

Using Standard Costs—Variable Manufacturing Overhead Variances

- Manufacturing Overhead Variances—A Closer Look

Variance Analysis and Management by Exception

Evaluation of Controls Based on Standard Costs

- Advantages of Standard Costs
- Potential Problems with the Use of Standard Costs

Appendix 9A: Predetermined Overhead Rates and Overhead Analysis in a Standard Costing System

- Predetermined Overhead Rates
- Overhead Application in a Standard Cost System
- Budget Variance
- Volume Variance
- Graphic Analysis of Fixed Overhead Variances
- Cautions in Fixed Overhead Analysis
- Reconciling Overhead Variances and Underapplied or Overapplied Overhead

Appendix 9B: Journal Entries to Record Variances

- Direct Materials Variances
- Direct Labor Variances
- Cost Flows in a Standard Cost System



LEARNING OBJECTIVES



After studying Chapter 9, you should be able to:

- LO1** Explain how direct materials standards and direct labor standards are set.
- LO2** Compute the direct materials price and quantity variances and explain their significance.
- LO3** Compute the direct labor rate and efficiency variances and explain their significance.
- LO4** Compute the variable manufacturing overhead rate and efficiency variances.
- LO5** (Appendix 9A) Compute and interpret the fixed overhead budget and volume variances.
- LO6** (Appendix 9B) Prepare journal entries to record standard costs and variances.

DECISION FEATURE

Managing Materials and Labor

Schneider Electric's Oxford, Ohio, plant manufactures metal-housed units (Busways) that transport electricity from its point of entry into a building to remote locations throughout the building. The plant's managers pay close attention to direct material costs because they constitute the majority of the plant's total manufacturing costs. To help control scrap rates for direct material inputs, such as copper, steel, and aluminum, the accounting department prepares direct materials quantity variances. These variances compare the standard quantity of direct materials that should have been used to make a product (according to computations made by the plant's engineers) to the amount of direct materials that were actually used. Quantifying these differences helps employees identify and deal with the causes of excessive scrap, such as an inadequately trained machine operator, poor quality raw material inputs, or a malfunctioning machine.

Because direct labor is also a significant component of the plant's total manufacturing costs, the management team also keeps daily tabs on its direct labor efficiency variance. This variance compares the standard amount of labor time allowed to make a product to the actual amount of labor time used. When idle workers cause an unfavorable labor efficiency variance, managers react to this information by temporarily moving workers from departments experiencing slack to those that are constraining production.

Source: Conversation with Doug Taylor, Plant Controller, Schneider Electric's Oxford, Ohio, plant.

Performance measures serve a critical role in attaining goals.

Imagine you want to improve your basketball shooting skill. You know that practice will help, so you go to the basketball court. There you start shooting toward the hoop, but as soon as the ball gets close to the rim your vision goes blurry for a second, so that you cannot observe where the ball ended up in relation to the target (left, right, in front, too far back, inside the hoop?). It would be pretty difficult to improve under those conditions. . . . (And by the way, how long would shooting baskets sustain your interest if you couldn't observe the outcome of your efforts?)

Or imagine someone engaging in a weight loss program. A normal step in such programs is to purchase a scale to be able to track one's progress: Is this program working? Am I losing weight? A positive answer would be encouraging and would motivate me to keep up the effort, while a negative answer might lead me to reflect on the process: Am I working on the right diet and exercise program? Am I doing everything I am supposed to? etc. Suppose you don't want to set up a sophisticated measurement system and decide to forgo the scale. You would still have some idea of how well you are doing from simple methods such as clothes feeling looser, a belt that fastens at a different hole, or simply via observation in a mirror! Now, imagine trying to sustain a weight loss program without any feedback on how well you are doing.

In these . . . examples, availability of quantitative measures of performance can yield two types of benefits: First, performance feedback can help improve the "production process" through a better understanding of what works and what doesn't; e.g., shooting this way works better than shooting that way. Secondly, feedback on performance can sustain motivation and effort, because it is encouraging and/or because it suggests that more effort is required for the goal to be met.¹

In the same way, performance measurement can be helpful in an organization. It can provide feedback concerning what works and what does not work, and it can help motivate people to sustain their efforts.

IN BUSINESS

Focusing on the Numbers

Joe Knight is the CEO of **Setpoint**, a company that designs and builds factory-automation equipment. Knight uses a large whiteboard, with about 20 rows and 10 columns, to focus worker attention on key factors involved in managing projects. A visitor to the plant, Steve Petersen, asked Knight to explain the board, but Knight instead motioned one of his workers to come over. The young man, with a baseball cap turned backward on his head, proceeded to walk the visitor through the board, explaining the calculation of gross margin and other key indicators on the board.

"I was just amazed," Petersen recalls. "He knew that board inside and out. He knew every number on it. He knew exactly where the company was and where they had to focus their attention. There was no hesitation. . . . I was so impressed . . . that the people on the shop floor had it down like that. It was their scoreboard. It was the way they could tell if they were winning or losing. I talked to several of them, and I just couldn't get over the positive attitude they had and their understanding of the numbers."

Source: Bo Burlinghan, "What's Your Culture Worth?," *Inc.* magazine, September 2001, pp. 124–133.

We encountered performance measures in the last chapter when we investigated flexible budget variances. These variances provide direct feedback concerning how well an organization performed in attaining its financial goals as expressed in the budget. The overall net operating income activity variance indicates what impact any change in activity had on profit. The revenue and spending variances indicate how well

¹Soumitra Dutta and Jean-François Manzoni, *Process Reengineering, Organizational Change and Performance Improvement* (New York: McGraw-Hill), Chapter IV.

revenues and costs were controlled. In the case of many of the spending variances, we can get even more detail about how well costs were controlled. For example, at Rick's Hairstyling, an unfavorable spending variance for hairstyling supplies could be due to using too many supplies or to paying too much for the supplies, or some combination of the two. It would be useful to separate those two different effects, particularly if different people are responsible for using the supplies and for purchasing them. In this chapter we will learn how that can be done for some costs; basically, we will be decomposing spending variances into two parts—a part that measures how well resources were used and a part that measures how well the acquisition prices of those resources were controlled.

We should keep in mind that performance measures should be derived from the organization's overall strategy. For example, a company like **Sony** that bases its strategy on rapid introduction of innovative consumer products should use different performance measures than a company like **Federal Express** that stresses on-time delivery, customer convenience, and low cost. Sony may want to keep close track of the percentage of revenues from products introduced within the last year; whereas Federal Express may want to closely monitor the percentage of packages delivered on time.

Companies in highly competitive industries like Federal Express, **Southwest Airlines**, **Dell**, and **Toyota** must be able to provide high-quality goods and services at low cost. If they do not, their customers will buy from more efficient competitors. Stated in the starkest terms, managers must obtain inputs such as raw materials and electricity at the lowest possible prices and must use them as effectively as possible—while maintaining or increasing the quality of what they sell. If inputs are purchased at prices that are too high or more input is used than is really necessary, higher costs will result.

How do managers control the prices that are paid for inputs and the quantities that are used? They could examine every transaction in detail, but this obviously would be an inefficient use of management time. For many companies, the answer to this control problem lies at least partially in *standard costs*.

STANDARD COSTS—MANAGEMENT BY EXCEPTION

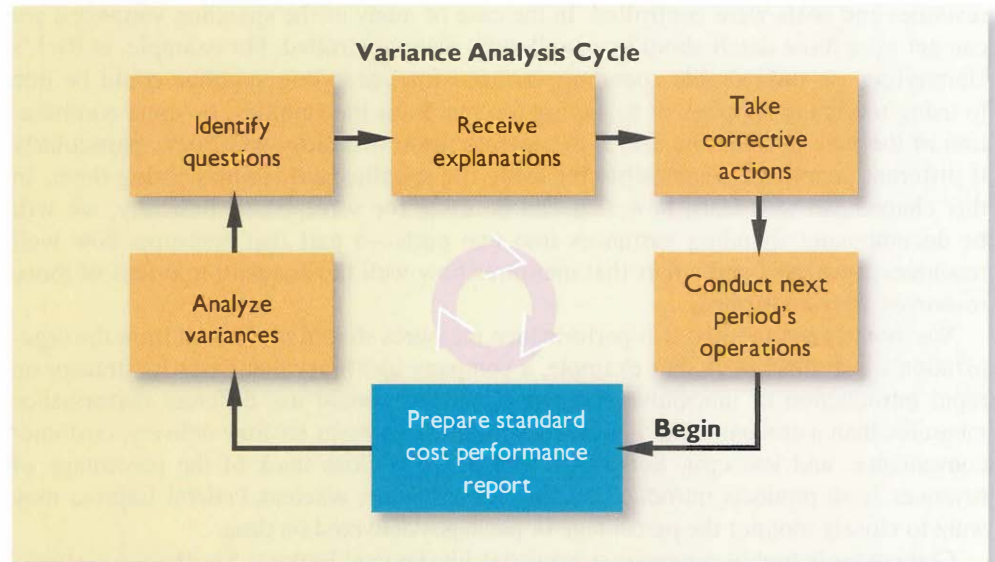
A *standard* is a benchmark or “norm” for measuring performance. Standards are found everywhere. Your doctor evaluates your weight using standards for individuals of your age, height, and gender. The food we eat in restaurants is prepared using standardized recipes. The buildings we live in conform to standards set in building codes. Standards are also widely used in managerial accounting where they relate to the *quantity* and *cost* (or acquisition price) of inputs used in manufacturing goods or providing services.

Quantity and price standards are set for each major input such as raw materials and labor time. *Quantity standards* specify how much of an input should be used to make a product or provide a service. *Price standards* specify how much should be paid for each unit of the input. Actual quantities and actual costs of inputs are compared to these standards. If either the quantity or the cost of inputs departs significantly from the standards, managers investigate the discrepancy to find the cause of the problem and eliminate it. This process is called **management by exception**.

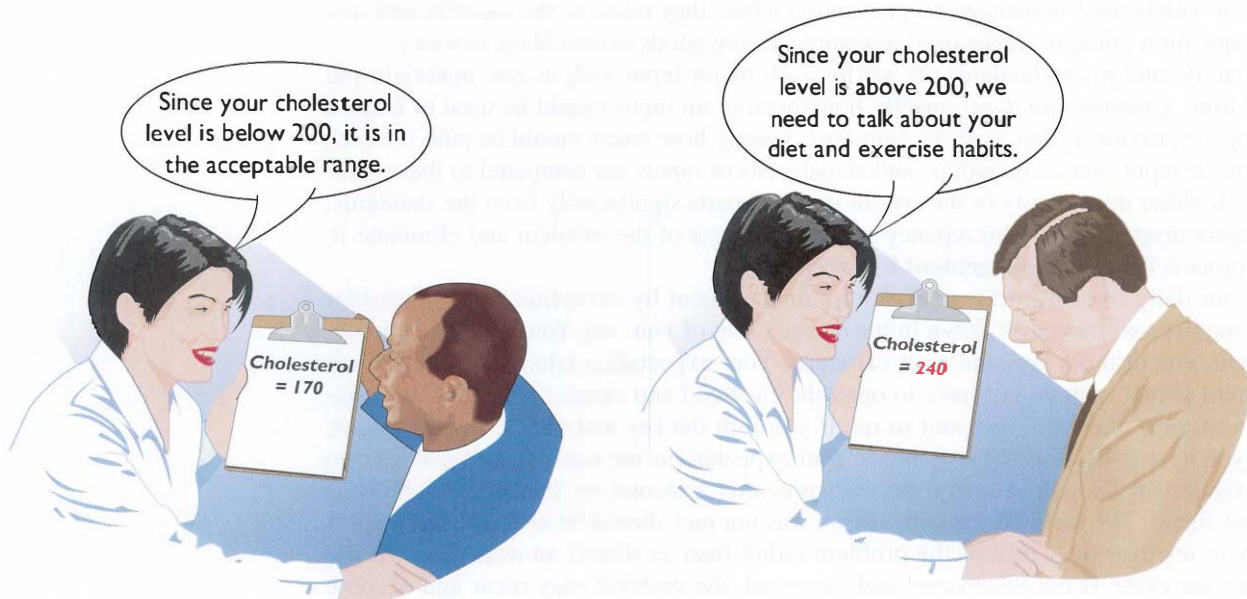
In our daily lives we often operate in a management by exception mode. Consider what happens when you sit down in the driver's seat of your car. You put the key in the ignition, you turn the key, and your car starts. Your expectation (standard) that the car will start is met; you do not have to open the car hood and check the battery, the connecting cables, the fuel lines, and so on. If you turn the key and the car does not start, then you have a discrepancy (variance). Your expectations are not met, and you need to investigate why. Note that even if the car starts after a second try, it still would be wise to investigate. The fact that the expectation was not met should be viewed as an opportunity to uncover the cause of the problem rather than as simply an annoyance. If the underlying cause is not discovered and corrected, the problem may recur and become much worse.

EXHIBIT 9-1

The Variance Analysis Cycle



This basic approach to identifying and solving problems is the essence of the *variance analysis cycle*, which is illustrated in Exhibit 9-1. The cycle begins with the preparation of standard cost performance reports in the accounting department. These reports highlight the *variances*, which are the differences between actual results and what should have occurred according to the standards. The variances raise questions. Why did this variance occur? Why is this variance larger than it was last period? The significant variances are investigated to discover their root causes. Corrective actions are taken. And then next period's operations are carried out. The cycle begins again with the preparation of a new standard cost performance report for the latest period. The emphasis should be on highlighting problems, finding their root causes, and then taking corrective action. The goal is to improve operations—not to assign blame.

Management by Exception

Who Uses Standard Costs?

Manufacturing, service, food, and not-for-profit organizations all make use of standards to some extent. Auto service centers like **Firestone** and **Sears**, for example, often set specific labor time standards for the completion of certain tasks, such as installing a carburetor or doing a valve job, and then measure actual performance against these standards. Fast-food outlets such as **McDonald's** have exacting standards for the quantity of meat going into a sandwich, as well as standards for the cost of the meat. Hospitals have standard costs for food, laundry, and other items, as well as standard time allowances for certain routine activities, such as laboratory tests. In short, you are likely to run into standard costs in virtually any line of business.



Manufacturing companies often have highly developed standard costing systems in which standards for direct materials, direct labor, and overhead are created for each product. A **standard cost card** shows the standard quantities and costs of the inputs required to produce a unit of a specific product. In the following section, we provide a detailed example of setting standard costs and preparing a standard cost card.

SETTING STANDARD COSTS

Setting price and quantity standards ideally combines the expertise of everyone who has responsibility for purchasing and using inputs. In a manufacturing setting, this might include accountants, purchasing managers, engineers, production supervisors, line managers, and production workers. Past records of purchase prices and input usage can be helpful in setting standards. However, the standards should be designed to encourage efficient *future* operations, not just a repetition of *past* operations that may or may not have been efficient.

Ideal versus Practical Standards

Should standards be attainable all of the time, part of the time, or almost none of the time? Opinions vary, but standards tend to fall into one of two categories---either ideal or practical.

Ideal standards can be attained only under the best circumstances. They allow for no machine breakdowns or other work interruptions, and they call for a level of effort that can be attained only by the most skilled and efficient employees working at peak effort 100% of the time. Some managers feel that such standards spur continual improvement. These managers argue that even though employees know they will rarely meet the standard, it is a constant reminder of the need for ever-increasing efficiency and effort. Few organizations use ideal standards. Most managers feel that ideal standards tend to discourage even the most diligent workers. Moreover, variances from ideal standards are difficult to interpret. Large variances from the ideal are normal and it is therefore difficult to “manage by exception.”

Practical standards are standards that are “tight but attainable.” They allow for normal machine downtime and employee rest periods, and they can be attained through reasonable, though highly efficient, efforts by the average worker. Variances from practical standards typically signal a need for management attention because they represent deviations that fall outside of normal operating conditions. Furthermore, practical standards can serve multiple purposes. In addition to signaling abnormal conditions, they can also be used in forecasting cash flows and in planning inventory. By contrast, ideal standards cannot be used for these purposes because they do not allow for normal inefficiencies and result in unrealistic forecasts.

Throughout the remainder of this chapter, we will assume that practical rather than ideal standards are in use.

**MANAGERIAL
ACCOUNTING IN
ACTION**

The Issue

Colonial Pewter Company

The Colonial Pewter Company was organized a year ago. The company's only product is a reproduction of an 18th century pewter bookend. The bookend is made largely by hand, using traditional metalworking tools. Consequently, the manufacturing process is labor intensive and requires a high level of skill.

Colonial Pewter has recently expanded its workforce to take advantage of unexpected demand for the bookends as gifts. The company started with a small cadre of experienced pewter workers but has had to hire less experienced workers as a result of the expansion. The president of the company, J. D. Wriston, has called a meeting to discuss production problems. Attending the meeting are Tom Kuchel, the production manager; Janet Warner, the purchasing manager; and Terry Sherman, the corporate controller.

J. D.: I've got a feeling that we aren't getting the production we should out of our new people.

Tom: Give us a chance. Some of the new people have been with the company for less than a month.

Janet: Let me add that production seems to be wasting an awful lot of material—particularly pewter. That stuff is very expensive.

Tom: What about the shipment of defective pewter that you bought a couple of months ago—the one with the iron contamination? That caused us major problems.

Janet: That's ancient history. How was I to know it was off-grade? Besides, it was a great deal.

J. D.: Calm down everybody. Let's get the facts before we start sinking our fangs into each other.

Tom: I agree. The more facts the better.

J. D.: Okay, Terry, it's your turn. Facts are the controller's department.

Terry: I'm afraid I can't provide the answers off the top of my head, but it won't take me too long to set up a system that can routinely answer questions relating to worker productivity, material waste, and input prices.

J. D.: How long is "not too long"?

Terry: I will need all of your cooperation, but how about a week from today?

J. D.: That's okay with me. What about everyone else?

Tom: Sure.

Janet: Fine with me.

J. D.: Let's mark it on our calendars.

IN BUSINESS

Skyrocketing Transportation Costs Affect Direct Materials Standards

Direct materials price standards should reflect the final delivered cost of the materials. Given increases in the costs of shipping raw materials across oceans, many companies have increased their price standards. For example, the average cost to rent a ship to transport raw materials from Brazil to China has increased from \$65,000 to \$180,000. In some instances, shipping costs now exceed the cost of the cargo itself. It costs about \$88 to ship a ton of iron ore from Brazil to Asia; however, the iron ore itself only costs \$60 per ton.

Source: Robert Guy Matthews, "Ship Shortage Pushes Up Prices of Raw Materials," *The Wall Street Journal*, October 22, 2007, p. A1 and A12.



Setting Direct Materials Standards

Terry Sherman's first task was to prepare price and quantity standards for the company's only significant raw material, pewter ingots. The **standard price per unit** for direct materials should reflect the final, delivered cost of the materials, net of any discounts taken. After consulting with purchasing manager Janet Warner, Terry prepared the following documentation for the standard price of a pound of pewter in ingot form:

Purchase price, top-grade pewter ingots, in 40-pound ingots.....	\$3.85
Freight, by truck, from the supplier's warehouse.....	0.24
Less purchase discount	(0.09)
Standard price per pound.....	<u>\$4.00</u>

Notice that the standard price reflects a particular grade of material (top grade), purchased in particular lot sizes (40-pound ingots), and delivered by a particular type of carrier (truck). Allowances have also been made for discounts. If everything proceeds according to these expectations, the net cost of a pound of pewter should be \$4.00.

The **standard quantity per unit** for direct materials should reflect the amount of material required for each unit of finished product as well as an allowance for unavoidable waste. After consulting with the production manager, Tom Kuchel, Terry Sherman prepared the following documentation for the standard quantity of pewter in a pair of bookends:

Material requirements as specified in the bill of materials	
for a pair of bookends, in pounds	2.7
Allowance for waste and spoilage, in pounds	0.2
Allowance for rejects, in pounds	<u>0.1</u>
Standard quantity per pair of bookends, in pounds.....	<u>3.0</u>

As discussed in an earlier chapter, the bill of materials details the quantity of each type of material that should be used in a product. As shown above, the material requirements listed on the bill of materials should be adjusted for waste and other factors when determining the standard quantity per unit of product. "Waste and spoilage" refers to materials that are wasted as a normal part of the production process or that spoil before they are used. "Rejects" refers to the direct material contained in defective units that must be scrapped.

Although allowances for waste, spoilage, and rejects are often built into standards, this practice is often criticized because it contradicts the zero defects goal that underlies improvement programs such as Six Sigma. If allowances for waste, spoilage, and rejects are built into the standard cost, those allowances should be periodically reviewed and reduced over time to reflect improved processes, better training, and better equipment.

Once the price and quantity standards have been set, the standard cost of material per unit of the finished product can be computed as follows:

$$3.0 \text{ pounds per unit} \times \$4.00 \text{ per pound} = \$12.00 \text{ per unit}$$

This \$12.00 cost will appear on the product's standard cost card.

Setting Direct Labor Standards

Direct labor price and quantity standards are usually expressed in terms of a labor rate and labor-hours. The **standard rate per hour** for direct labor includes wages, employment taxes, and fringe benefits. Using wage records and in consultation with the production

LEARNING OBJECTIVE 1

Explain how direct materials standards and direct labor standards are set.



manager, Terry Sherman determined the standard rate per direct labor-hour at the Colonial Pewter Company as follows:

Basic wage rate per hour.....	\$10.00
Employment taxes at 10% of the basic rate	1.00
Fringe benefits at 30% of the basic rate	<u>3.00</u>
Standard rate per direct labor-hour.....	<u>\$14.00</u>

Many companies prepare a single standard rate per hour for all employees in a department. This standard rate reflects the expected “mix” of workers, even though the actual wage rates may vary somewhat from individual to individual due to differing skills or seniority. According to the standard computed above, the direct labor rate for Colonial Pewter should average \$14 per hour.

The standard direct labor time required to complete a unit of product (called the **standard hours per unit**) is perhaps the single most difficult standard to determine. One approach is to break down each task into elemental body movements (such as reaching, pushing, and turning over). Published tables of standard times for such movements can be used to estimate the total time required to complete the task. Another approach is for an industrial engineer to do a time and motion study, actually clocking the time required for each task. As stated earlier, the standard time should include allowances for breaks, personal needs of employees, cleanup, and machine downtime.

After consulting with the production manager, Terry Sherman prepared the following documentation for the standard direct labor hours per unit:

Basic labor time per unit, in hours.....	1.9
Allowance for breaks and personal needs	0.1
Allowance for cleanup and machine downtime	0.3
Allowance for rejects	<u>0.2</u>
Standard direct labor-hours per unit of product	<u>2.5</u>

Once the rate and time standards have been set, the standard direct labor cost per unit of product can be computed as follows:

$$2.5 \text{ direct labor-hours per unit} \times \$14 \text{ per direct labor-hour} = \$35 \text{ per unit}$$

This \$35 per unit standard direct labor cost appears along with direct materials on the standard cost card for a pair of pewter bookends.

YOU DECIDE



Owner of a Painting Company

Having painted a relative's house last summer, you have decided to start your own housepainting company this summer and have hired several of your friends. An uncle who is in the construction business has suggested that you use time standards for various tasks such as preparing wood siding, painting wood trim, and painting wood siding. A table of such standards for professional painters has been published in a recent issue of a trade magazine for painting contractors. What advantages and disadvantages do you see in using such standards? How do you think they should be used in your business, if at all?

EXHIBIT 9-2
Standard Cost Card—Variable
Manufacturing Costs

Inputs	(1) Standard Quantity or Hours	(2) Standard Price or Rate	Standard Cost (1) × (2)
Direct materials.....	3.0 pounds	\$4.00 per pound	\$12.00
Direct labor.....	2.5 hours	\$14.00 per hour	35.00
Variable manufacturing overhead.....	2.5 hours	\$3.00 per hour	7.50
Total standard cost per unit.....			<u>\$54.50</u>

Setting Variable Manufacturing Overhead Standards

As with direct labor, the price and quantity standards for variable manufacturing overhead are usually expressed in terms of rate and hours. The rate represents *the variable portion of the predetermined overhead rate* discussed in the job-order costing chapter; the hours relate to the activity base that is used to apply overhead to units of product (usually machine-hours or direct labor-hours). At Colonial Pewter, the variable portion of the predetermined overhead rate is \$3 per direct labor-hour. Therefore, the standard variable manufacturing overhead cost per unit is computed as follows:

$$2.5 \text{ direct labor-hours per unit} \times \$3 \text{ per direct labor-hour} = \$7.50 \text{ per unit}$$

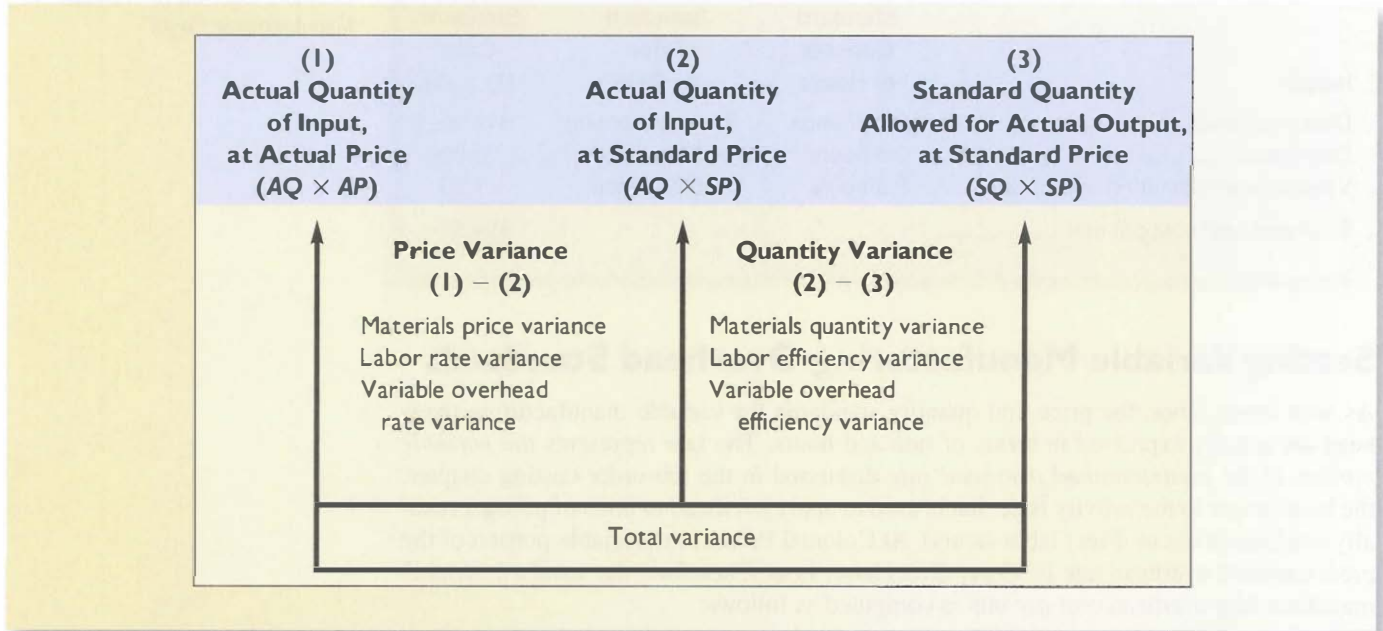
This \$7.50 per unit cost for variable manufacturing overhead appears along with direct materials and direct labor on the standard cost card in Exhibit 9-2. Observe that the **standard cost per unit** for variable manufacturing overhead is computed the same way as for direct materials or direct labor—the standard quantity allowed per unit of the output is multiplied by the standard price. In this case, the standard quantity is expressed as 2.5 direct labor-hours per unit and the standard price (or rate) is expressed as \$3 per direct labor-hour.

A GENERAL MODEL FOR VARIANCE ANALYSIS

Why are standards separated into two categories—price and quantity? Different managers are usually responsible for buying and for using inputs. For example, in the case of a raw material, a purchasing manager is responsible for its price. However, the production manager is responsible for the amount of the raw material actually used to make products. As we shall see, setting up separate standards for price and quantity allows us to better separate the responsibilities of these two managers. It also allows us to prepare more timely reports. The purchasing manager's tasks are completed when the material is delivered for use in the factory. A performance report for the purchasing manager can be prepared at that point. However, the production manager's responsibilities have just begun at that point. A performance report for the production manager must be delayed until production is completed and it is known how much raw material was used in the final product. Therefore, it is important to clearly distinguish between deviations from price standards (the responsibility of the purchasing manager) and deviations from quantity standards (the responsibility of the production manager).

Price and Quantity Variances

Exhibit 9-3 presents a general model that isolates *price variances* from *quantity variances* for variable costs. A **price variance** is the difference between the actual price of an input and its standard price, multiplied by the actual amount of the input purchased. A **quantity variance** is the difference between how much of an input was actually used and how much should have been used and is stated in dollar terms using the standard price of the input.

EXHIBIT 9-3 A General Model for Variance Analysis—Variable Manufacturing Costs

Three things should be noted from Exhibit 9-3. First, a price variance and a quantity variance can be computed for each of the three variable cost elements—direct materials, direct labor, and variable manufacturing overhead—even though the variances have different names. For example, a price variance is called a *materials price variance* in the case of direct materials but a *labor rate variance* in the case of direct labor and a *variable overhead rate variance* in the case of variable manufacturing overhead.

Second, the price variance—regardless of what it is called—is computed in exactly the same way regardless of whether one is dealing with direct materials, direct labor, or variable manufacturing overhead. The same is true of the quantity variance.

Third, the input is the actual quantity of direct materials, direct labor, and variable manufacturing overhead purchased or used; the output is the good production of the period, expressed in terms of the *standard quantity* (or the *standard hours*) allowed for the actual output (see column 3 in Exhibit 9-3). The **standard quantity allowed** or **standard hours allowed** means the amount of an input *that should have been used* to produce the actual output of the period. This could be more or less than the actual amount of the input, depending on the efficiency or inefficiency of operations. The standard quantity allowed is computed by multiplying the actual output in units by the standard input allowed per unit of output.

With this general model as the foundation, we will now calculate Colonial Pewter's price and quantity variances.

USING STANDARD COSTS—DIRECT MATERIALS VARIANCES

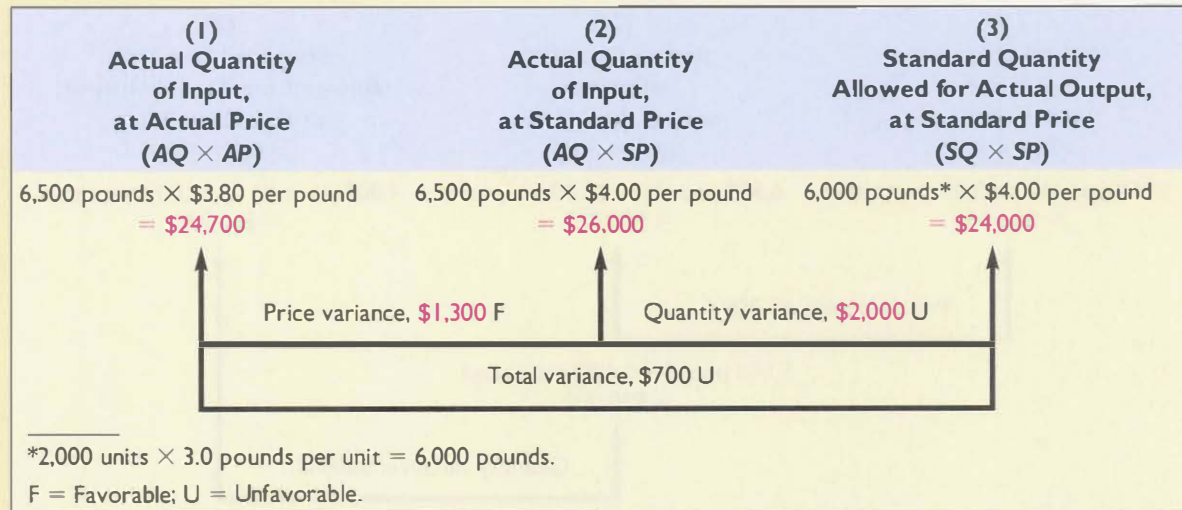
LEARNING OBJECTIVE 2

Compute the direct materials price and quantity variances and explain their significance.

After determining Colonial Pewter Company's standard costs for direct materials, direct labor, and variable manufacturing overhead, Terry Sherman's next step was to compute the company's variances for June, the most recent month. As discussed in the preceding section, variances are computed by comparing standard costs to actual costs. Terry referred to the standard cost card in Exhibit 9-2 that shows the standard cost of direct materials was computed as follows:

$$3.0 \text{ pounds per unit} \times \$4.00 \text{ per pound} = \$12 \text{ per unit}$$



EXHIBIT 9-4 Variance Analysis—Direct Materials

Colonial Pewter's records for June showed that 6,500 pounds of pewter were purchased at a cost of \$3.80 per pound. This cost included freight and was net of a quantity purchase discount. All of the material purchased was used during June to manufacture 2,000 pairs of pewter bookends. Using these data and the standard costs from Exhibit 9-2, Terry computed the price and quantity variances shown in Exhibit 9-4.

The three arrows in Exhibit 9-4 point to three different total cost figures. The first, \$24,700, refers to the actual total cost of the pewter that was purchased during June. The second, \$26,000, refers to what the pewter would have cost if it had been purchased at the standard price of \$4.00 a pound rather than the actual price of \$3.80 a pound. The difference between these two figures, \$1,300 (\$26,000 – \$24,700), is the price variance. It exists because the actual purchase price was \$0.20 per pound less than the standard purchase price. Because 6,500 pounds were purchased, the total amount of the variance is \$1,300 (\$0.20 per pound × 6,500 pounds). This variance is labeled favorable (denoted by F) because the actual purchase price was less than the standard purchase price. A price variance is labeled unfavorable (denoted by U) if the actual purchase price exceeds the standard purchase price.

The third arrow in Exhibit 9-4 points to \$24,000—the cost if the pewter had been purchased at the standard price *and* only the standard quantity allowed per unit had been used. The standards call for 3 pounds of pewter per unit. Because 2,000 units were produced, 6,000 pounds of pewter should have been used. This is referred to as the standard quantity allowed for the actual output. If this 6,000 pounds of pewter had been purchased at the standard price of \$4.00 per pound, the company would have spent \$24,000. The difference between this figure, \$24,000, and the figure at the end of the middle arrow in Exhibit 9-4, \$26,000, is the quantity variance of \$2,000.

To understand this quantity variance, note that the actual amount of pewter used in production was 6,500 pounds. However, the standard amount of pewter allowed for the actual output is 6,000 pounds. Therefore, too much pewter was used to produce the actual output—by a total of 500 pounds. To express this in dollar terms, the 500 pounds is multiplied by the standard price of \$4.00 per pound to yield the quantity variance of \$2,000. Why is the standard price, rather than the actual price, of the pewter used in this calculation? The production manager is ordinarily responsible for the quantity variance. If the actual price were used in the calculation of the quantity variance, the production manager would be held responsible for the efficiency or inefficiency of the purchasing manager. Apart from

EXHIBIT 9-5 Variance Analysis—Direct Materials, When the Amount Purchased Differs from the Amount Used

(1) Actual Quantity of Input, at Actual Price (AQ × AP)	(2) Actual Quantity of Input, at Standard Price (AQ × SP)	(3) Standard Quantity Allowed for Actual Output, at Standard Price (SQ × SP)
6,500 pounds × \$3.80 per pound = \$24,700	6,500 pounds × \$4.00 per pound = \$26,000	4,800 pounds* × \$4.00 per pound = \$19,200
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> \uparrow Price variance, \$1,300 F </div> <div style="text-align: center;"> \uparrow 5,000 pounds × 4.00 per pound = \$20,000 </div> <div style="text-align: center;"> \uparrow Quantity variance, \$800 U </div> </div>		
<p>A total variance, like the one shown in Exhibit 9-4, can't be computed in this situation because the amount of materials purchased (6,500 pounds) differs from the amount used in production (5,000 pounds).</p> <p>*1,600 units × 3.0 pounds per unit = 4,800 pounds.</p>		

being unfair, fruitless arguments between the production manager and purchasing manager would occur every time the actual price of an input was above its standard price. To avoid these arguments, the standard price is used when computing the quantity variance.

The quantity variance in Exhibit 9-4 is labeled unfavorable (denoted by U). This is because more pewter was used to produce the actual output than the standard allows. A quantity variance is labeled favorable (F) if the actual quantity is less than the standard quantity.

The computations in Exhibit 9-4 reflect the fact that all of the material purchased during June was also used during June. How are the variances computed if the amount of material purchased differs from the amount that is used? To illustrate, assume that during June the company purchased 6,500 pounds of materials, as before, but that it used only 5,000 pounds of material during the month and produced only 1,600 units. In this case, the price variance and quantity variance would be computed as shown in Exhibit 9-5.

Most companies compute the materials price variance when materials are *purchased* rather than when they are used in production. There are two reasons for this practice. First, delaying the computation of the price variance until the materials are used would result in less timely variance reports. Second, computing the price variance when the materials are purchased allows materials to be carried in the inventory accounts at their standard cost. This greatly simplifies bookkeeping. (See Appendix 9B at the end of the chapter for an explanation of how the bookkeeping works in a standard costing system.)

Note from the exhibit that the price variance is computed on the entire amount of material purchased (6,500 pounds), as before, whereas the quantity variance is computed only on the portion of this material used in production during the month (5,000 pounds). What about the other 1,500 pounds of material that were purchased during the period, but that have not yet been used? When those materials are used in future periods, a quantity variance will be computed. However, a price variance will not be computed when the materials are finally used because the price variance was computed when the materials were purchased. The situation illustrated in Exhibit 9-5 is common for companies that purchase materials well in advance of when they are used in production.

Materials Price Variance—A Closer Look

A **materials price variance** measures the difference between what is paid for a given quantity of materials and what should have been paid according to the standard. From Exhibit 9–4, this difference can be expressed by the following formula:

$$\text{Materials price variance} = (AQ \times AP) - (AQ \times SP)$$

↑ Actual quantity ↑ Actual price ↑ Standard price

The formula can be factored as follows:

$$\text{Materials price variance} = AQ(AP - SP)$$

Using the data from Exhibit 9–4 in this formula, we have the following:

$$\text{Materials price variance} = 6,500 \text{ pounds} (\$3.80 \text{ per pound} - \$4.00 \text{ per pound}) = \$1,300 \text{ F}$$

Notice that the answer is the same as that shown in Exhibit 9–4. Also note that when using this formula approach, a negative variance is always labeled as favorable (F) and a positive variance is always labeled as unfavorable (U). This will be true of all variance formulas in this chapter.

Variance reports are often presented in the form of a table. An excerpt from Colonial Pewter's variance report is shown below along with the purchasing manager's explanation for the materials price variance.

Colonial Pewter Company						
Variance Report—Purchasing Department						
	(1)	(2)	(3)	(4)		
Item Purchased	Quantity Purchased	Actual Price	Standard Price	Difference in Price (2) – (3)	Total Price Variance (1) × (4)	Explanation
Pewter	6,500 pounds	\$3.80	\$4.00	\$0.20	\$1,300 F	Bargained for an especially good price.

F = Favorable; U = Unfavorable.

Isolation of Variances Variances should be isolated and brought to the attention of management as quickly as possible so that problems can be promptly identified and corrected. The most significant variances should be viewed as “red flags”; an exception has occurred that requires explanation by the responsible manager and perhaps follow-up effort. The performance report itself may contain explanations for the variances, as illustrated above. In the case of Colonial Pewter Company, the purchasing manager said that the favorable price variance resulted from bargaining for an especially good price.

Responsibility for the Variance Who is responsible for the materials price variance? Generally speaking, the purchasing manager has control over the price paid for goods and is therefore responsible for the materials price variance. Many factors influence the prices paid for goods including how many units are ordered, how the order is delivered, whether the order is a rush order, and the quality of materials purchased. If any of these factors deviates from what was assumed when the standards were set, a price variance can

result. For example, purchasing second-grade materials rather than top-grade materials may result in a favorable price variance because the lower-grade materials may be less costly. However, we should keep in mind that the lower-grade materials may create production problems.

However, someone other than the purchasing manager could be responsible for a materials price variance. For example, due to production problems beyond the purchasing manager's control, the purchasing manager may have to use express delivery. In these cases, the production manager should be held responsible for the resulting price variances.

A word of caution is in order. Variance analysis should not be used to assign blame. The emphasis should be on *supporting* the line managers and *assisting* them in meeting the goals that they have participated in setting for the company. In short, the emphasis should be positive rather than negative. Excessive dwelling on what has already happened, particularly in terms of trying to find someone to blame, can destroy morale and kill any cooperative spirit.

IN BUSINESS

Managing Materials Price Variances



When **Tata Motors** lost \$110 million in 2000, the company's executives mandated a 10% reduction in costs. Tata's purchasing managers responded by using reverse auctions to buy raw materials. Reverse auctions require suppliers to bid against one another for the right to sell raw material inputs to Tata Motors. The supplier who places the lowest bid wins the contract. Tata's purchasing managers have used 750 reverse auctions a year to lower the company's average purchase prices by 7%. While this practice produces favorable purchase price variances and higher profits in the short run, these benefits may eventually be offset by greater scrap, rework, warranty repairs, customer complaints, and lost sales.

Source: Robyn Meredith, "The Next People's Car," *Forbes*, April 16, 2007, pp. 70–74.

Materials Quantity Variance—A Closer Look

The **materials quantity variance** measures the difference between the quantity of materials used in production and the quantity that should have been used according to the standard. Although the variance is concerned with the physical usage of materials, as shown in Exhibit 9-4, it is generally stated in dollar terms to help gauge its importance. The formula for the materials quantity variance is as follows:

$$\text{Materials quantity variance} = (AQ \times SP) - (SQ \times SP)$$

↑ ↑ ↑
 Actual quantity Standard price Standard quantity allowed for actual output

Again, the formula can be factored as follows:

$$\text{Materials quantity variance} = SP(AQ - SQ)$$

Using the data from Exhibit 9-4 in the formula, we have the following:

$$SQ = 2,000 \text{ units} \times 3.0 \text{ pounds per unit} = 6,000 \text{ pounds.}$$

$$\begin{aligned} \text{Materials quantity variance} &= \$4.00 \text{ per pound} (6,500 \text{ pounds} - 6,000 \text{ pounds}) \\ &= \$2,000 \text{ U} \end{aligned}$$

The answer, of course, is the same as that shown in Exhibit 9–4.

The data might appear as follows if a formal variance report were prepared:

Colonial Pewter Company Variance Report—Production Department						
	(1)	(2)	(3)	(4)	Total Quantity Variance (1) × (4)	Explanation
Type of Materials	Standard Price	Actual Quantity	Standard Quantity Allowed	Difference in Quantity (2) – (3)		
Pewter	\$4.00	6,500 pounds	6,000 pounds	500 pounds	\$2,000 U	Low-quality materials unsuitable for production.

F = Favorable; U = Unfavorable.

It is best to isolate the materials quantity variance when materials are used in production. Materials are drawn for the number of units to be produced, according to the standard bill of materials for each unit. Any additional materials are usually drawn with an excess materials requisition slip, which is different in color from the normal requisition slips. This procedure calls attention to the excessive usage of materials *while production is still in process* and provides an opportunity to correct any developing problem.

Excessive materials usage can result from many factors, including faulty machines, inferior materials quality, untrained workers, and poor supervision. Generally speaking, it is the responsibility of the production department to see that material usage is kept in line with standards. There may be times, however, when the *purchasing* department is responsible for an unfavorable materials quantity variance. For example, if the purchasing department buys inferior materials at a lower price, the materials may be unsuitable for use and may result in excessive waste. Thus, purchasing rather than production would be responsible for the quantity variance. At Colonial Pewter, the production manager, Tom Kuchel, claimed on the Production Department's Performance Report that low-quality materials were the cause of the unfavorable materials quantity variance for June.

- The standard and actual prices per pound of raw material are \$4.00 and \$4.50, respectively. A total of 10,500 pounds of raw material was purchased and then used to produce 5,000 units. The quantity standard allows two pounds of the raw material per unit produced. What is the materials quantity variance?
 - \$5,000 unfavorable
 - \$5,000 favorable
 - \$2,000 favorable
 - \$2,000 unfavorable
- Referring to the facts in question 1 above, what is the material price variance?
 - \$5,250 favorable
 - \$5,250 unfavorable
 - \$5,000 unfavorable
 - \$5,000 favorable



USING STANDARD COSTS—DIRECT LABOR VARIANCES

LEARNING OBJECTIVE 3

Compute the direct labor rate and efficiency variances and explain their significance.



Terry Sherman's next step in determining Colonial Pewter's variances for June was to compute the direct labor variances for the month. Recall from Exhibit 9-2 that the standard direct labor cost per unit of product is \$35, computed as follows:

$$2.5 \text{ hours per unit} \times \$14.00 \text{ per hour} = \$35 \text{ per unit}$$

During June, the company paid its direct labor workers \$74,250, including employment taxes and fringe benefits, for 5,400 hours of work. This was an average of \$13.75 per hour. Using these data and the standard costs from Exhibit 9-2, Terry computed the direct labor rate and efficiency variances that appear in Exhibit 9-6.

Notice that the column headings in Exhibit 9-6 are the same as those used in the prior two exhibits, except that in Exhibit 9-6 the terms *hours* and *rate* are used in place of the terms *quantity* and *price*.

Labor Rate Variance—A Closer Look

As explained earlier, the price variance for direct labor is commonly called the **labor rate variance**. This variance measures any deviation from standard in the average hourly rate paid to direct labor workers. The formula for the labor rate variance is expressed as follows:

$$\text{Labor rate variance} = (AH \times AR) - (AH \times SR)$$

↑ ↑ ↑
 Actual hours Actual rate Standard rate

The formula can be factored as follows:

$$\text{Labor rate variance} = AH(AR - SR)$$

Using the data from Exhibit 9-6 in the formula, the labor rate variance can be computed as follows:

$$\text{Labor rate variance} = 5,400 \text{ hours} (\$13.75 \text{ per hour} - \$14.00 \text{ per hour}) = \$1,350 \text{ F}$$

EXHIBIT 9-6 Variance Analysis—Direct Labor

Actual Hours of Input, at the Actual Rate (AH × AR)	Actual Hours of Input, at the Standard Rate (AH × SR)	Standard Hours Allowed for Actual Output, at the Standard Rate (SH × SR)
5,400 hours × \$13.75 per hour = \$74,250	5,400 hours × \$14.00 per hour = \$75,600	5,000 hours* × \$14.00 per hour = \$70,000
↑ Rate variance, \$1,350 F		↑ Efficiency variance, \$5,600 U
↑ Total variance, \$4,250 U		

*2,000 units × 2.5 hours per unit = 5,000 hours.
F = Favorable; U = Unfavorable.

In most companies, the wage rates paid to workers are quite predictable. Nevertheless, rate variances can arise because of the way labor is used. Skilled workers with high hourly rates of pay may be given duties that require little skill and call for lower hourly rates of pay. This will result in an unfavorable labor rate variance because the actual hourly rate of pay will exceed the standard rate specified for the particular task. In contrast, a favorable rate variance would result when workers who are paid at a rate lower than specified in the standard are assigned to the task. However, the lower-paid workers may not be as efficient. Finally, overtime work at premium rates will result in an unfavorable rate variance if the overtime premium is charged to the direct labor account.

Who is responsible for controlling the labor rate variance? Because labor rate variances generally arise as a result of how labor is used, production supervisors are usually responsible for seeing that labor rate variances are kept under control.

Labor Efficiency Variance—A Closer Look

The **labor efficiency variance** attempts to measure the productivity of direct labor. No variance is more closely watched by management because it is widely believed that increasing direct labor productivity is vital to reducing costs. The formula for the labor efficiency variance is expressed as follows:

$$\text{Labor efficiency variance} = (AH \times SR) - (SH \times SR)$$

↑ Actual hours ↑ Standard rate ↑ Standard hours allowed for actual output

The formula can be factored as follows:

$$\text{Labor efficiency variance} = SR(AH - SH)$$

Using the data from Exhibit 9–6 in the formula, we have the following:

$$SH = 2,000 \text{ units} \times 2.5 \text{ hours per unit} = 5,000 \text{ hours.}$$

$$\text{Labor efficiency variance} = \$14.00 \text{ per hour} (5,400 \text{ hours} - 5,000 \text{ hours}) = \$5,600 \text{ U}$$

Possible causes of an unfavorable labor efficiency variance include poorly trained or motivated workers; poor quality materials, requiring more labor time; faulty equipment, causing breakdowns and work interruptions; poor supervision of workers; and inaccurate standards. The managers in charge of production would usually be responsible for control of the labor efficiency variance. However, the purchasing manager could be held responsible if the purchase of poor-quality materials resulted in excessive labor processing time.

Another important cause of an unfavorable labor efficiency variance may be insufficient demand for the company's products. Managers in some companies argue that it is difficult, and perhaps unwise, to constantly adjust the workforce in response to changes in the amount of work that needs to be done. In such companies, the direct labor workforce is essentially fixed in the short run. If demand is insufficient to keep everyone busy, workers are not laid off and an unfavorable labor efficiency variance will often be recorded.

If customer orders are insufficient to keep the workers busy, the work center manager has two options—either accept an unfavorable labor efficiency variance or build inventory.² A central lesson of Lean Production is that building inventory with no immediate prospect of sale is a bad idea. Excessive inventory—particularly work in process

²For further discussion, see Eliyahu M. Goldratt and Jeff Cox, *The Goal*, 2nd rev. ed. (Croton-on-Hudson, NY: North River Press).

inventory—leads to high defect rates, obsolete goods, and inefficient operations. As a consequence, when the workforce is basically fixed in the short term, managers must be cautious about how labor efficiency variances are used. Some experts advocate eliminating labor efficiency variances in such situations—at least for the purposes of motivating and controlling workers on the shop floor.

DECISION MAKER



Department Resources Manager

You are the manager of the computer-generated special effects department for a company that produces special effects for high-profile films. You receive a copy of this month's performance report for your department and discover a large labor efficiency variance that is unfavorable. What factors might have contributed to this unfavorable variance?

IN BUSINESS

Does Direct Labor Variance Reporting Increase Productivity?

Professors Rajiv Banker, Sarv Devaraj, Roger Schroeder, and Kingshuk Sinha studied the direct labor variance reporting practices at 18 plants of a Fortune 500 manufacturing company. Seven of the plants eliminated direct labor variance reporting and the other 11 plants did not. The group of seven plants that eliminated direct labor variance reporting experienced an 11% decline in labor productivity, which was significantly greater than the decline experienced by the other 11 plants. The authors estimated that the annual loss due to the decline in labor productivity across the seven plants of \$1,996,000 was only partially offset by the \$200,000 saved by eliminating the need to track direct labor variances.

While these findings suggest that direct labor variance reporting is a useful tool for monitoring direct labor workers, advocates of Lean Production would argue otherwise. They would claim that direct labor variance reporting is a non-value-added activity that encourages excessive production and demoralizes direct labor workers. The two points of view provide an interesting opportunity to debate the appropriate role of management accounting within organizations.

Source: Rajiv Banker, Sarv Devaraj, Roger Schroeder, and Kingshuk Sinha, "Performance Impact of the Elimination of Direct Labor Variance Reporting: A Field Study," *Journal of Accounting Research*, September 2002, pp. 1013–1036.

USING STANDARD COSTS—VARIABLE MANUFACTURING OVERHEAD VARIANCES

LEARNING OBJECTIVE 4

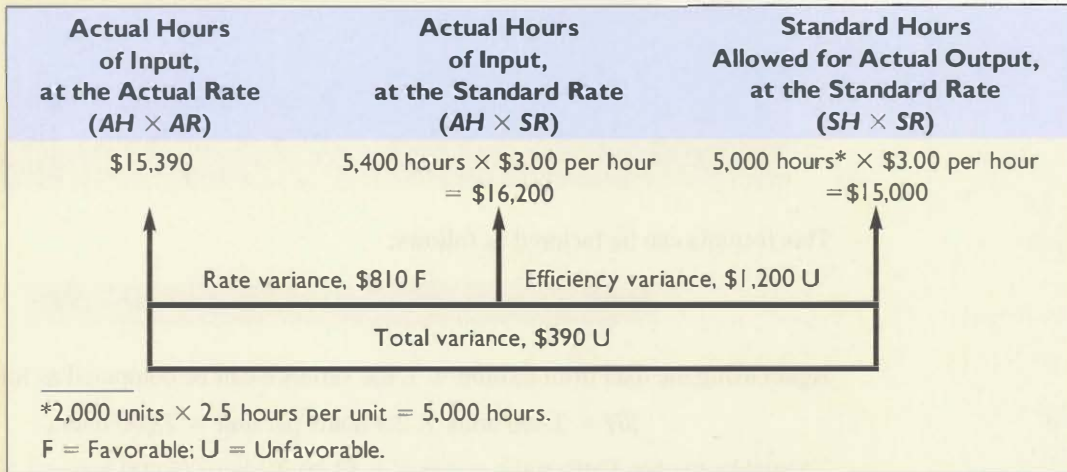
Compute the variable manufacturing overhead rate and efficiency variances.

The final step in Terry Sherman's analysis of Colonial Pewter's variances for June was to compute the variable manufacturing overhead variances. The variable portion of manufacturing overhead can be analyzed using the same basic formulas that we used to analyze direct materials and direct labor. Recall from Exhibit 9–2 that the standard variable manufacturing overhead is \$7.50 per unit of product, computed as follows:

$$2.5 \text{ hours per unit} \times \$3.00 \text{ per hour} = \$7.50 \text{ per unit}$$

Colonial Pewter's cost records showed that the total actual variable manufacturing overhead cost for June was \$15,390. Recall from the earlier discussion of the direct labor

EXHIBIT 9-7 Variance Analysis—Variable Manufacturing Overhead



variances that 5,400 hours of direct labor time were recorded during the month and that the company produced 2,000 pairs of bookends. Terry’s analysis of this overhead data appears in Exhibit 9-7.

Notice the similarities between Exhibits 9-6 and 9-7. These similarities arise from the fact that direct labor-hours are being used as the base for allocating overhead cost to units of product; thus, the same hourly figures appear in Exhibit 9-7 for variable manufacturing overhead as in Exhibit 9-6 for direct labor. The main difference between the two exhibits is in the standard hourly rate being used, which in this company is much lower for variable manufacturing overhead than for direct labor.

Manufacturing Overhead Variances—A Closer Look

The formula for the **variable overhead rate variance** is expressed as follows:

$$\text{Variable overhead rate variance} = (AH \times AR) - (AH \times SR)$$

↑ ↑ ↑
 Actual hours Actual rate Standard rate

This formula can be factored as follows:

$$\text{Variable overhead rate variance} = AH(AR - SR)$$

Using the data from Exhibit 9-7 in the formula, the variable overhead rate variance can be computed as follows:

$$AR = \$15,390 \div 5,400 \text{ hours} = \$2.85 \text{ per hour}$$

$$\begin{aligned} \text{Variable overhead rate variance} &= 5,400 \text{ hours} (\$2.85 \text{ per hour} - \$3.00 \text{ per hour}) \\ &= \$810 \text{ F} \end{aligned}$$

**Colonial
Pewter
Company**

In preparation for the scheduled meeting to discuss her analysis of Colonial Pewter's standard costs and variances, Terry distributed Exhibits 9–2 through 9–7 to the management group of Colonial Pewter. This included J. D. Wriston, the president of the company; Tom Kuchel, the production manager; and Janet Warner, the purchasing manager. J. D. Wriston opened the meeting with the following question:

J. D.: Terry, I think I understand the report you distributed, but just to make sure, would you mind summarizing the highlights of what you found?

Terry: As you can see, the biggest problems are the unfavorable materials quantity variance of \$2,000 and the unfavorable labor efficiency variance of \$5,600.

J. D.: Tom, you're the production boss. What do you think is causing the unfavorable labor efficiency variance?

Tom: It has to be the new production workers. Our experienced workers shouldn't have much problem meeting the standard of 2.5 hours per unit. We all knew that there would be some inefficiency for a while as we brought new people on board. My plan for overcoming the problem is to pair up each of the new guys with one of our old-timers and have them work together for a while. It would slow down our older guys a bit, but I'll bet the unfavorable variance disappears and our new workers would learn a lot.

J. D.: Sounds good. Now, what about that \$2,000 unfavorable materials quantity variance?

Terry: Tom, are the new workers generating a lot of scrap?

Tom: Yeah, I guess so.

J. D.: I think that could be part of the problem. Can you do anything about it?

Tom: I can watch the scrap closely for a few days to see where it's being generated. If it is the new workers, I can have the old-timers work with them on the problem when I team them up.

J. D.: Janet, the favorable materials price variance of \$1,300 isn't helping us if it is contributing to the unfavorable materials quantity and labor efficiency variances. Let's make sure that our raw material purchases conform to our quality standards.

Janet: Fair enough.

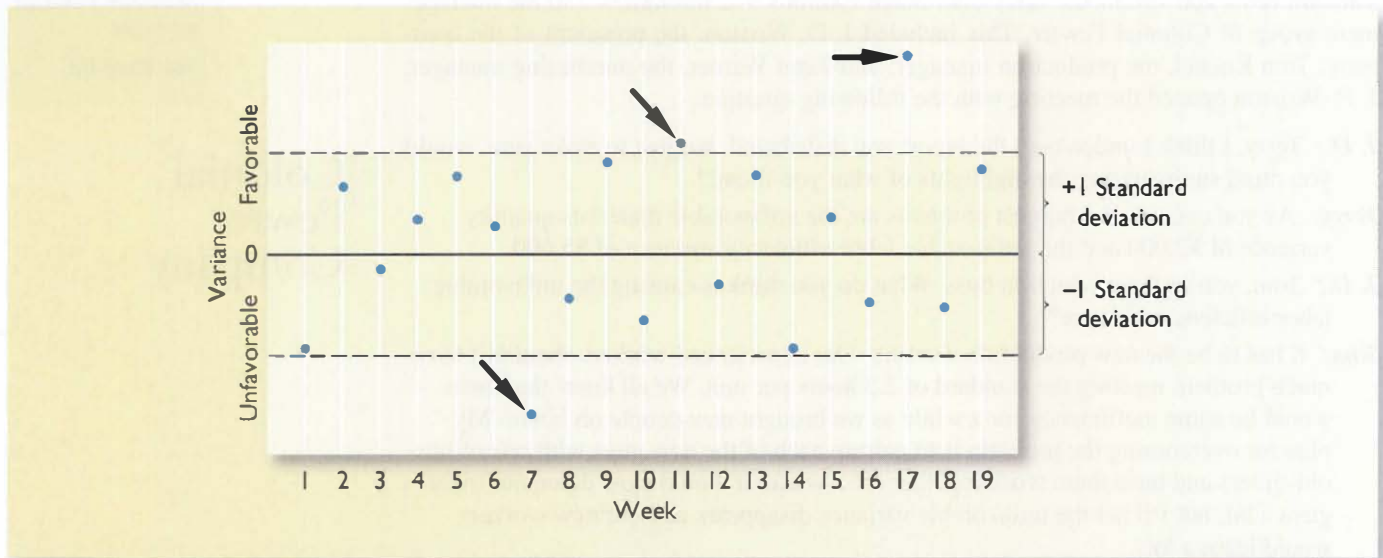
J. D.: Good. Let's reconvene in a few weeks to see what has happened. Hopefully, we can get those unfavorable variances under control.

VARIANCE ANALYSIS AND MANAGEMENT BY EXCEPTION

Variance analysis and performance reports are important elements of *management by exception*, which is an approach that emphasizes focusing on those areas of responsibility where goals and expectations are not being met.

The budgets and standards discussed in this chapter and in the preceding chapter reflect management's plans. If all goes according to plan, there will be little difference between actual results and the results that would be expected according to the budgets and standards. If this happens, managers can concentrate on other issues. However, if actual results do not conform to the budget and to standards, the performance reporting system sends a signal to managers that an "exception" has occurred. This signal is in the form of a variance from the budget or standards.

However, are all variances worth investigating? The answer is no. Differences between actual results and what was expected will almost always occur. If every variance were investigated, management would waste a great deal of time tracking down nickel-and-dime differences. Variances may occur for a variety of reasons—only some of which are significant and worthy of management's attention. For example, hotter-than-normal weather in the summer may result in higher-than-expected electrical bills for air conditioning. Or, workers may work slightly faster or slower on a particular day. Because

EXHIBIT 9-8 A Statistical Control Chart

of unpredictable random factors, one can expect that virtually every cost category will produce a variance of some kind.

How should managers decide which variances are worth investigating? One clue is the size of the variance. A variance of \$5 is probably not big enough to warrant attention, whereas a variance of \$5,000 might well be worth tracking down. Another clue is the size of the variance relative to the amount of spending. A variance that is only 0.1% of spending on an item is likely to be well within the bounds one would normally expect due to random factors. On the other hand, a variance of 10% of spending is much more likely to be a signal that something is wrong.

A more dependable approach is to plot variance data on a statistical control chart, such as illustrated in Exhibit 9-8. The basic idea underlying a statistical control chart is that some random fluctuations in variances from period to period are normal. A variance should only be investigated when it is unusual relative to that normal level of random fluctuation. Typically, the standard deviation of the variances is used as the measure of the normal level of fluctuations. A rule of thumb is adopted such as “investigate all variances that are more than X standard deviations from zero.” In the control chart in Exhibit 9-8, X is 1.0. That is, the rule of thumb in this company is to investigate all variances that are more than one standard deviation in either direction (favorable or unfavorable) from zero. This means that the variances in weeks 7, 11, and 17 would have been investigated, but none of the others.

What value of X should be chosen? The bigger the value of X , the wider the band of acceptable variances that would not be investigated. Thus, the bigger the value of X , the less time will be spent tracking down variances, but the more likely it is that a real out-of-control situation will be overlooked. Ordinarily, if X is selected to be 1.0, roughly 30% of all variances will trigger an investigation even though there is no real problem. If X is set at 1.5, the figure drops to about 13%. If X is set at 2.0, the figure drops all the way to about 5%. Don't forget, however, that selecting a big value of X will result not only in fewer false alarms but also in a higher probability that a real problem will be overlooked.

In addition to watching for unusually large variances, the pattern of the variances should be monitored. For example, a run of steadily mounting variances should trigger an investigation even though none of the variances is large enough by itself to warrant investigation.

EVALUATION OF CONTROLS BASED ON STANDARD COSTS

Advantages of Standard Costs

Standard cost systems have a number of advantages.

1. Standard costs are a key element in a management by exception approach. If costs conform to the standards, managers can focus on other issues. When costs are significantly outside the standards, managers are alerted that problems may exist that require attention. This approach helps managers focus on important issues.
2. Standards that are viewed as reasonable by employees can promote economy and efficiency. They provide benchmarks that individuals can use to judge their own performance.
3. Standard costs can greatly simplify bookkeeping. Instead of recording actual costs for each job, the standard costs for direct materials, direct labor, and overhead can be charged to jobs.
4. Standard costs fit naturally in an integrated system of “responsibility accounting.” The standards establish what costs should be, who should be responsible for them, and whether actual costs are under control.

Potential Problems with the Use of Standard Costs

The improper use of standard costs can present a number of potential problems.

1. Standard cost variance reports are usually prepared on a monthly basis and often are released days or even weeks after the end of the month. As a consequence, the information in the reports may be so outdated that it is almost useless. Timely, frequent reports that are approximately correct are better than infrequent reports that are very precise but out of date by the time they are released. Some companies are now reporting variances and other key operating data daily or even more frequently.
2. If managers are insensitive and use variance reports as a club, morale will suffer. Employees should receive positive reinforcement for work well done. Management by exception, by its nature, tends to focus on the negative. If variances are used as a club, subordinates may be tempted to cover up unfavorable variances or take actions that are not in the best interests of the company to make sure the variances are favorable. For example, workers may put on a crash effort to increase output at the end of the month to avoid an unfavorable labor efficiency variance. In the rush to produce more output, quality may suffer.
3. Labor quantity standards and efficiency variances make two important assumptions. First, they assume that the production process is labor-paced; if labor works faster, output will go up. However, output in many companies is not determined by how fast labor works; rather, it is determined by the processing speed of machines. Second, the computations assume that labor is a variable cost. However, direct labor may be essentially fixed. If labor is fixed, then an undue emphasis on labor efficiency variances creates pressure to build excess inventories.
4. In some cases, a “favorable” variance can be as bad or worse than an “unfavorable” variance. For example, **McDonald’s** has a standard for the amount of hamburger meat that should be in a Big Mac. A “favorable” variance would mean that less meat was used than the standard specifies. The result is a substandard Big Mac and possibly a dissatisfied customer.
5. Too much emphasis on meeting the standards may overshadow other important objectives such as maintaining and improving quality, on-time delivery, and customer satisfaction. This tendency can be reduced by using supplemental performance measures that focus on these other objectives.



6. Just meeting standards may not be sufficient; continual improvement using techniques such as Six Sigma may be necessary to survive in a competitive environment. For this reason, some companies focus on the trends in the standard cost variances—aiming for continual improvement rather than just meeting the standards. In other companies, engineered standards are replaced either by a rolling average of actual costs, which is expected to decline, or by very challenging target costs.

In sum, managers should exercise considerable care when using a standard cost system. It is particularly important that managers go out of their way to focus on the positive, rather than just on the negative, and to be aware of possible unintended consequences.

SUMMARY

LO1 Explain how direct materials standards and direct labor standards are set.

Each direct cost has both a price and a quantity standard. The standard price for an input is the price that should be paid for a single unit of the input. In the case of direct materials, the price should include shipping costs and should be net of quantity and other discounts. In the case of direct labor, the standard rate should include wages, fringe benefits, and employment taxes.

LO2 Compute the direct materials price and quantity variances and explain their significance.

The materials price variance is the difference between the actual price paid for materials and the standard price, multiplied by the quantity purchased. An unfavorable variance occurs whenever the actual price exceeds the standard price. A favorable variance occurs when the actual price is less than the standard price for the input.

The materials quantity variance is the difference between the amount of materials actually used and the amount that should have been used to produce the actual good output of the period, multiplied by the standard price per unit of the input. An unfavorable materials quantity variance occurs when the amount of materials actually used exceeds the amount that should have been used according to the materials quantity standard. A favorable variance occurs when the amount of materials actually used is less than the amount that should have been used according to the standard.

LO3 Compute the direct labor rate and efficiency variances and explain their significance.

The direct labor rate variance is the difference between the actual wage rate paid and the standard wage rate, multiplied by the hours worked. An unfavorable variance occurs whenever the actual wage rate exceeds the standard wage rate. A favorable variance occurs when the actual wage rate is less than the standard wage rate.

The labor efficiency variance is the difference between the hours actually worked and the hours that should have been used to produce the actual good output of the period, multiplied by the standard wage rate. An unfavorable labor efficiency variance occurs when the hours actually worked exceed the hours allowed for the actual output. A favorable variance occurs when the hours actually worked are less than hours allowed for the actual output.

LO4 Compute the variable manufacturing overhead rate and efficiency variances.

The variable manufacturing overhead rate variance is the difference between the actual variable manufacturing overhead cost incurred and the actual hours worked multiplied by the standard variable manufacturing overhead rate. The variable manufacturing overhead efficiency variance is the difference between the hours actually worked and the hours that should have been used to produce the actual good output of the period, multiplied by the standard variable manufacturing overhead rate.

GUIDANCE ANSWERS TO DECISION MAKER AND YOU DECIDE

Owner of a Painting Company (p. 404)

The standards published in the trade magazine are for professional painters; at least initially, these standards would not be realistic for your inexperienced painting crew. Therefore, the standards would not be particularly useful for bidding on jobs or for setting budgets. Nevertheless, the standards would provide important feedback about how well the painting crew is performing relative to the professional competition. Setting a goal of beating the professional painters (as represented by the standards) might energize your painting crew and motivate them to work harder and to think of innovative ways of improving the painting process.

Psychologically, it might be best not to use the labels *unfavorable* and *favorable* for the variances since almost all of them will initially be unfavorable. Instead, you might focus on the ratio of the actual time to the standard time, with the idea that this ratio should decline over time and eventually should be less than 1.0. This ratio could be plotted on a weekly or daily basis and displayed in a prominent location so that everyone in the painting crew can see how well the crew is doing relative to professional painters.

Department Resources Manager (p. 414)

An unfavorable labor efficiency variance in the computer-generated special effects department might have been caused by inexperienced, poorly trained, or unmotivated employees, faulty hardware and/or software that may have caused work interruptions, and/or poor supervision of the employees in this department. In addition, it is possible that there was insufficient demand for the output of this department—resulting in idle time—or that the standard (or benchmark) for this department is inaccurate.

GUIDANCE ANSWERS TO CONCEPT CHECKS

1. **Choice d.** The materials quantity variance is $(10,500 \text{ pounds used} - 10,000 \text{ pounds allowed}) \times \$4.00 \text{ per pound} = \$2,000 \text{ unfavorable}$.
2. **Choice b.** The materials price variance is $(\$4.50 \text{ actual price per pound} - \$4.00 \text{ standard price per pound}) \times 10,500 \text{ pounds purchased} = \$5,250 \text{ unfavorable}$.
3. **Choice a.** The direct labor efficiency variance is $(4,500 \text{ hours} - 5,000 \text{ hours}) \times \$8.00 \text{ standard hourly rate} = \$4,000 \text{ favorable}$.
4. **Choice d.** The variable overhead efficiency variance is $(4,500 \text{ hours} - 5,000 \text{ hours}) \times \$5.00 \text{ per hour} = \$2,500 \text{ favorable}$.



REVIEW PROBLEM: STANDARD COSTS

Xavier Company produces a single product. Variable manufacturing overhead is applied to products on the basis of direct labor-hours. The standard costs for one unit of product are as follows:

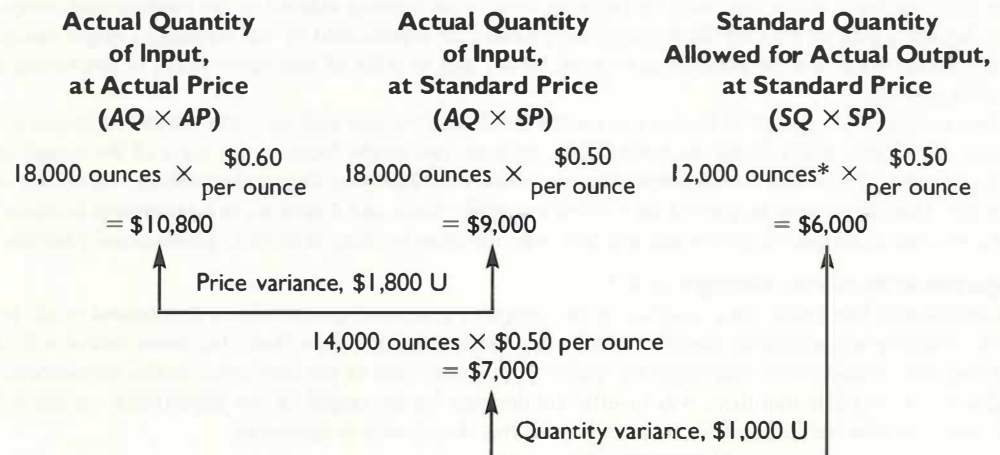
Direct material: 6 ounces at \$0.50 per ounce	\$ 3
Direct labor: 1.8 hours at \$10 per hour	18
Variable manufacturing overhead: 1.8 hours at \$5 per hour	9
Total standard variable cost per unit	<u>\$30</u>

During June, 2,000 units were produced. The costs associated with June's operations were as follows:

Material purchased: 18,000 ounces at \$0.60 per ounce	\$10,800
Material used in production: 14,000 ounces	—
Direct labor: 4,000 hours at \$9.75 per hour	\$39,000
Variable manufacturing overhead costs incurred	\$20,800

Required:

Compute the direct materials, direct labor, and variable manufacturing overhead variances.

Solution to the Review Problem**Direct Materials Variances**

*2,000 units × 6 ounces per unit = 12,000 ounces.

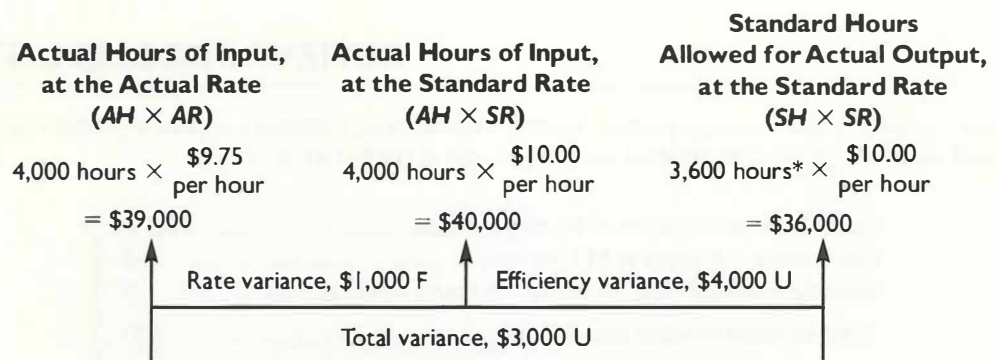
Using the formulas in the chapter, the same variances would be computed as follows:

$$\text{Materials price variance} = AQ(AP - SP)$$

$$18,000 \text{ ounces } (\$0.60 \text{ per ounce} - \$0.50 \text{ per ounce}) = \$1,800 \text{ U}$$

$$\text{Materials quantity variance} = SP(AQ - SQ)$$

$$\$0.50 \text{ per ounce } (14,000 \text{ ounces} - 12,000 \text{ ounces}) = \$1,000 \text{ U}$$

Direct Labor Variances

*2,000 units × 1.8 hours per unit = 3,600 hours.

Using the formulas in the chapter, the same variances would be computed as:

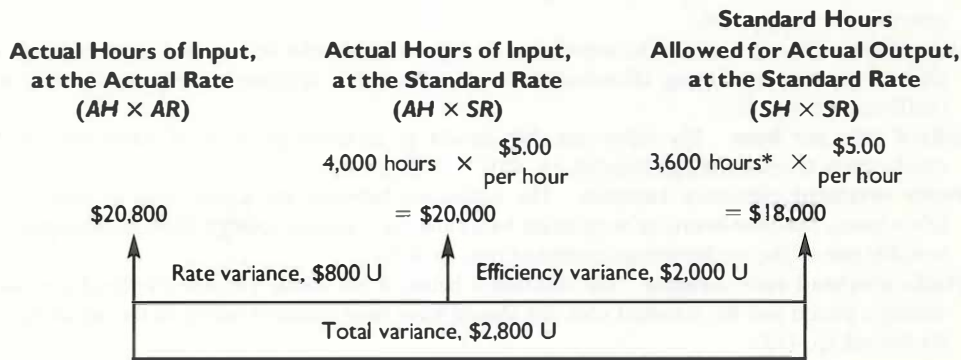
$$\text{Labor rate variance} = AH(AR - SR)$$

$$4,000 \text{ hours } (\$9.75 \text{ per hour} - \$10.00 \text{ per hour}) = \$1,000 \text{ F}$$

$$\text{Labor efficiency variance} = SR(AH - SH)$$

$$\$10.00 \text{ per hour } (4,000 \text{ hours} - 3,600 \text{ hours}) = \$4,000 \text{ U}$$

Variable Manufacturing Overhead Variances



*2,000 units × 1.8 hours per unit = 3,600 hours.

Using the formulas in the chapter, the same variances would be computed as follows:

$$\text{Variable overhead rate variance} = AH(AR - SR)$$

$$AR = \$20,800 \div 4,000 \text{ hours} = \$5.20 \text{ per hour}$$

$$4,000 \text{ hours} (\$5.20 \text{ per hour} - \$5.00 \text{ per hour}) = \$800 \text{ U}$$

$$\text{Variable overhead efficiency variance} = SR(AH - SH)$$

$$\$5.00 \text{ per hour} (4,000 \text{ hours} - 3,600 \text{ hours}) = \$2,000 \text{ U}$$

GLOSSARY

Ideal standards Standards that assume peak efficiency at all times. (p. 401)

Labor efficiency variance The difference between the actual hours taken to complete a task and the standard hours allowed for the actual output, multiplied by the standard hourly labor rate. (p. 413)

Labor rate variance The difference between the actual hourly labor rate and the standard rate, multiplied by the number of hours worked during the period. (p. 412)

Management by exception A management system in which standards are set for various activities, with actual results compared to these standards. Significant deviations from standards are flagged as exceptions. (p. 399)

Materials price variance The difference between the actual unit price paid for an item and the standard price, multiplied by the quantity purchased. (p. 409)

Materials quantity variance The difference between the actual quantity of materials used in production and the standard quantity allowed for the actual output, multiplied by the standard price per unit of materials. (p. 410)

Practical standards Standards that allow for normal machine downtime and other work interruptions and that can be attained through reasonable, though highly efficient, efforts by the average worker. (p. 401)

Price variance A variance that is computed by taking the difference between the actual price and the standard price and multiplying the result by the actual quantity of the input. (p. 405)

Quantity variance A variance that is computed by taking the difference between the actual quantity of the input used and the amount of the input that should have been used for the actual level of output and multiplying the result by the standard price of the input. (p. 405)

Standard cost card A detailed listing of the standard amounts of inputs and their costs that are required to produce a unit of a specific product. (p. 401)

Standard cost per unit The standard quantity allowed of an input per unit of a specific product, multiplied by the standard price of the input. (p. 405)

Standard hours allowed The time that should have been taken to complete the period's output. It is computed by multiplying the actual number of units produced by the standard hours per unit. (p. 406)

Standard hours per unit The amount of direct labor time that should be required to complete a single unit of product, including allowances for breaks, machine downtime, cleanup, rejects, and other normal inefficiencies. (p. 404)

Standard price per unit The price that should be paid for an input. The price should be net of discounts and should include any shipping costs. (p. 403)

Standard quantity allowed The amount of an input that should have been used to complete the period's actual output. It is computed by multiplying the actual number of units produced by the standard quantity per unit. (p. 406)

Standard quantity per unit The amount of an input that should be required to complete a single unit of product, including allowances for normal waste, spoilage, rejects, and other normal inefficiencies. (p. 403)

Standard rate per hour The labor rate that should be incurred per hour of labor time, including employment taxes and fringe benefits. (p. 403)

Variable overhead efficiency variance The difference between the actual level of activity (direct labor-hours, machine-hours, or some other base) and the standard activity allowed, multiplied by the variable part of the predetermined overhead rate. (p. 416)

Variable overhead rate variance The difference between the actual variable overhead cost incurred during a period and the standard cost that should have been incurred based on the actual activity of the period. (p. 415)

QUESTIONS

- 9-1 What is a quantity standard? What is a price standard?
- 9-2 Distinguish between ideal and practical standards.
- 9-3 What is meant by the term *management by exception*?
- 9-4 Why are separate price and quantity variances computed?
- 9-5 Who is generally responsible for the materials price variance? The materials quantity variance? The labor efficiency variance?
- 9-6 The materials price variance can be computed at what two different points in time? Which point is better? Why?
- 9-7 If the materials price variance is favorable but the materials quantity variance is unfavorable, what might this indicate?
- 9-8 Should standards be used to identify whom to blame for problems?
- 9-9 "Our workers are all under labor contracts; therefore, our labor rate variance is bound to be zero." Discuss.
- 9-10 What effect, if any, would you expect poor-quality materials to have on direct labor variances?
- 9-11 If variable manufacturing overhead is applied to production on the basis of direct labor-hours and the direct labor efficiency variance is unfavorable, will the variable overhead efficiency variance be favorable or unfavorable, or could it be either? Explain.
- 9-12 What is a statistical control chart, and how is it used?
- 9-13 Why can undue emphasis on labor efficiency variances lead to excess work in process inventories?



Multiple-choice questions are provided on the text website at www.mhhe.com/brewer5e.

BRIEF EXERCISES

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BRIEF EXERCISE 9-1 Setting Standards; Preparing a Standard Cost Card [LO1]

Martin Company manufactures a powerful cleaning solvent. The main ingredient in the solvent is a raw material called Echol. Information concerning the purchase and use of Echol follows:

Purchase of Echol Echol is purchased in 15-gallon containers at a cost of \$115 per container. A discount of 2% is offered by the supplier for payment within 10 days, and Martin Company takes all discounts. Shipping costs, which Martin Company must pay, amount to \$130 for an average shipment of 100 15-gallon containers of Echol.

Use of Echol The bill of materials calls for 7.6 quarts of Echol per bottle of cleaning solvent. (Each gallon contains four quarts.) About 5% of all Echol used is lost through spillage or evaporation (the 7.6 quarts above is the *actual* content per bottle). In addition, statistical analysis has shown that every 41st bottle is rejected at final inspection because of contamination.

Required:

1. Compute the standard purchase price for one quart of Echol.
2. Compute the standard quantity of Echol (in quarts) per salable bottle of cleaning solvent.
3. Using the data from (1) and (2) above, prepare a standard cost card showing the standard cost of Echol per bottle of cleaning solvent.

BRIEF EXERCISE 9-2 Direct Materials Variances [LO2]

Bandar Industries Berhad of Malaysia manufactures sporting equipment. One of the company's products, a football helmet for the North American market, requires a special plastic. During the quarter ending June 30, the company manufactured 35,000 helmets, using 22,500 kilograms of plastic. The plastic cost the company RM171,000. (The currency in Malaysia is the ringgit, which is denoted here by RM.)

According to the standard cost card, each helmet should require 0.6 kilograms of plastic, at a cost of RM8 per kilogram.

Required:

1. What cost for plastic should have been incurred to make 35,000 helmets? How much greater or less is this than the cost that was incurred?
2. Break down the difference computed in (1) above into a materials price variance and a materials quantity variance.

BRIEF EXERCISE 9-3 Direct Labor Variances [LO3]

SkyChefs, Inc., prepares in-flight meals for a number of major airlines. One of the company's products is grilled salmon in dill sauce with baby new potatoes and spring vegetables. During the most recent week, the company prepared 4,000 of these meals using 960 direct labor-hours. The company paid these direct labor workers a total of \$9,600 for this work, or \$10.00 per hour.

According to the standard cost card for this meal, it should require 0.25 direct labor-hours at a cost of \$9.75 per hour.

Required:

1. What direct labor cost should have been incurred to prepare 4,000 meals? How much does this differ from the actual direct labor cost?
2. Break down the difference computed in (1) above into a labor rate variance and a labor efficiency variance.

BRIEF EXERCISE 9-4 Variable Overhead Variances [LO4]

Logistics Solutions provides order fulfillment services for dot-com merchants. The company maintains warehouses that stock items carried by its dot-com clients. When a client receives an order from a customer, the order is forwarded to Logistics Solutions, which pulls the item from storage, packs it, and ships it to the customer. The company uses a predetermined variable overhead rate based on direct labor-hours.

In the most recent month, 120,000 items were shipped to customers using 2,300 direct labor-hours. The company incurred a total of \$7,360 in variable overhead costs.

According to the company's standards, 0.02 direct labor-hours are required to fulfill an order for one item and the variable overhead rate is \$3.25 per direct labor-hour.

Required:

1. What variable overhead cost should have been incurred to fill the orders for the 120,000 items? How much does this differ from the actual variable overhead cost?
2. Break down the difference computed in (1) above into a variable overhead rate variance and a variable overhead efficiency variance.



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EXERCISES

EXERCISE 9-5 Setting Standards [LO1]

Victoria Chocolates, Ltd., makes premium handcrafted chocolate confections in London. The owner of the company is setting up a standard cost system and has collected the following data for one of the company's products, the Empire Truffle. This product is made with the finest white chocolate and various fillings. The data below pertain only to the white chocolate used in the product (the currency is stated in pounds denoted here as £):

Material requirements, kilograms of white chocolate per dozen truffles....	0.70 kilograms
Allowance for waste, kilograms of white chocolate per dozen truffles.....	0.03 kilograms
Allowance for rejects, kilograms of white chocolate per dozen truffles	0.02 kilograms
Purchase price, finest grade white chocolate	£7.50 per kilogram
Purchase discount.....	8% of purchase price
Shipping cost from the supplier in Belgium	£0.30 per kilogram
Receiving and handling cost.....	£0.04 per kilogram

Required:

1. Determine the standard price of a kilogram of white chocolate.
2. Determine the standard quantity of white chocolate for a dozen truffles.
3. Determine the standard cost of the white chocolate in a dozen truffles.

**EXERCISE 9-6 Direct Materials and Direct Labor Variances [LO2, LO3]**

Dawson Toys, Ltd., produces a toy called the Maze. The company has recently established a standard cost system to help control costs and has established the following standards for the Maze toy:

Direct materials: 6 microns per toy at \$0.50 per micron
 Direct labor: 1.3 hours per toy at \$8 per hour

During July, the company produced 3,000 Maze toys. Production data for the month on the toy follow:

Direct materials: 25,000 microns were purchased at a cost of \$0.48 per micron. 5,000 of these microns were still in inventory at the end of the month.

Direct labor: 4,000 direct labor-hours were worked at a cost of \$36,000.

Required:

1. Compute the following variances for July:
 - a. Direct materials price and quantity variances.
 - b. Direct labor rate and efficiency variances.
2. Prepare a brief explanation of the possible causes of each variance.

EXERCISE 9-7 Direct Materials and Direct Labor Variances [LO2, LO3]

Huron Company produces a commercial cleaning compound known as Zoom. The direct materials and direct labor standards for one unit of Zoom are given below:

	Standard Quantity or Hours	Standard Price or Rate	Standard Cost
Direct materials.....	4.6 pounds	\$2.50 per pound	\$11.50
Direct labor.....	0.2 hours	\$12.00 per hour	\$2.40

During the most recent month, the following activity was recorded:

- a. Twenty thousand pounds of material were purchased at a cost of \$2.35 per pound.
- b. All of the material purchased was used to produce 4,000 units of Zoom.
- c. 750 hours of direct labor time were recorded at a total labor cost of \$10,425.

Required:

1. Compute the direct materials price and quantity variances for the month.
2. Compute the direct labor rate and efficiency variances for the month.

EXERCISE 9-8 Direct Materials Variances [LO2]

Refer to the data in Exercise 9-7. Assume that instead of producing 4,000 units during the month, the company produced only 3,000 units, using 14,750 pounds of material. (The rest of the material purchased remained in raw materials inventory.)

Required:

Compute the direct materials price and quantity variances for the month.

EXERCISE 9-9 Direct Labor and Variable Manufacturing Overhead Variances [LO3, LO4]

Erie Company manufactures a small CD player called the Jogging Mate. The company uses standards to control its costs. The labor standards that have been set for one Jogging Mate CD player are as follows:

Standard Hours	Standard Rate per Hour	Standard Cost
18 minutes	\$12.00	\$3.60

During August, 5,750 hours of direct labor time were needed to make 20,000 units of the Jogging Matc. The direct labor cost totaled \$73,600 for the month.

Required:

1. What direct labor cost should have been incurred to make 20,000 units of the Jogging Matc? By how much does this differ from the cost that was incurred?
2. Break down the difference in cost from (1) above into a labor rate variance and a labor efficiency variance.
3. The budgeted variable manufacturing overhead rate is \$4 per direct labor-hour. During August, the company incurred \$21,850 in variable manufacturing overhead cost. Compute the variable overhead rate and efficiency variances for the month.

EXERCISE 9-10 Working Backwards from Labor Variances [LO3]

The auto repair shop of Quality Motor Company uses standards to control the labor time and labor cost in the shop. The standard labor cost for a motor tune-up is given below:



Job	Standard Hours	Standard Rate	Standard Cost
Motor tune-up	2.5	\$9.00	\$22.50

The record showing the time spent in the shop last week on motor tune-ups has been misplaced. However, the shop supervisor recalls that 50 tune-ups were completed during the week, and the controller recalls the following variance data relating to tune-ups:

Labor rate variance	\$87 F
Total labor variance	\$93 U

Required:

1. Determine the number of actual labor-hours spent on tune-ups during the week.
 2. Determine the actual hourly rate of pay for tune-ups last week.
- (Hint: A useful way to proceed would be to work from known to unknown data either by using the variance formulas or by using the columnar format shown in Exhibit 9-6.)

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PROBLEMS

PROBLEM 9-11A Basic Variance Analysis [LO2, LO3, LO4]

Becton Labs, Inc., produces various chemical compounds for industrial use. One compound, called Fludex, is prepared using an elaborate distilling process. The company has developed standard costs for one unit of Fludex, as follows:

- CHECK FIGURE**
- (1a) Materials price variance: \$15,000 F;
 - (2a) Labor efficiency variance: \$4,375 U

	A	B	C	D	E	F
1		Standard Quantity		Standard Price or Rate		Standard Cost
2	Direct materials	2.5 ounces		\$20.00 per ounce		\$ 50.00
3	Direct labor	1.4 hours		\$12.50 per hour		17.50
4	Variable manufacturing overhead	1.4 hours		\$3.50 per hour		4.90
5						<u>\$ 72.40</u>
6						



During November, the following activity was recorded relative to production of Fludex:

- Materials purchased, 12,000 ounces at a cost of \$225,000.
 - There was no beginning inventory of materials; however, at the end of the month, 2,500 ounces of material remained in ending inventory.
 - The company employs 35 lab technicians to work on the production of Fludex. During November, they worked an average of 160 hours at an average rate of \$12 per hour.
 - Variable manufacturing overhead is assigned to Fludex on the basis of direct labor-hours. Variable manufacturing overhead costs during November totaled \$18,200.
 - During November, 3,750 good units of Fludex were produced.
- The company's management is anxious to determine the efficiency of Fludex production activities.

Required:

- For direct materials used in the production of Fludex:
 - Compute the price and quantity variances.
 - The materials were purchased from a new supplier who is anxious to enter into a long-term purchase contract. Would you recommend that the company sign the contract? Explain.
- For direct labor employed in the production of Fludex:
 - Compute the rate and efficiency variances.
 - In the past, the 35 technicians employed in the production of Fludex consisted of 20 senior technicians and 15 assistants. During November, the company experimented with fewer senior technicians and more assistants in order to save costs. Would you recommend that the new labor mix be continued? Explain.
- Compute the variable overhead rate and efficiency variances. What relation can you see between this efficiency variance and the labor efficiency variance?

CHECK FIGURE

- (1a) Materials price variance: \$3,000 F;
 (2) Net variance: \$16,290 U



PROBLEM 9-12A Comprehensive Variance Analysis [LO2, LO3, LO4]

Miller Toy Company manufactures a plastic swimming pool at its Westwood Plant. The plant has been experiencing problems as shown by its June contribution format income statement below:

	Budgeted	Actual
Sales (15,000 pools)	\$450,000	\$450,000
Variable expenses:		
Variable cost of goods sold*	180,000	196,290
Variable selling expenses	20,000	20,000
Total variable expenses	200,000	216,290
Contribution margin	250,000	233,710
Fixed expenses:		
Manufacturing overhead	130,000	130,000
Selling and administrative	84,000	84,000
Total fixed expenses	214,000	214,000
Net operating income	\$ 36,000	\$ 19,710

*Contains direct materials, direct labor, and variable manufacturing overhead.

Janet Dunn, who has just been appointed general manager of the Westwood Plant, has been given instructions to "get things under control." Upon reviewing the plant's income statement, Ms. Dunn has concluded that the major problem lies in the variable cost of goods sold. She has been provided with the following standard cost per swimming pool:

	Standard Quantity or Hours	Standard Price or Rate	Standard Cost
Direct materials	3.0 pounds	\$2.00 per pound	\$ 6.00
Direct labor	0.8 hours	\$6.00 per hour	4.80
Variable manufacturing overhead	0.4 hours*	\$3.00 per hour	1.20
Total standard cost			\$12.00

*Based on machine-hours.

During June the plant produced 15,000 pools and incurred the following costs:

- Purchased 60,000 pounds of materials at a cost of \$1.95 per pound.
- Used 49,200 pounds of materials in production. (Finished goods and work in process inventories are insignificant and can be ignored.)
- Worked 11,800 direct labor-hours at a cost of \$7.00 per hour.
- Incurred variable manufacturing overhead cost totaling \$18,290 for the month. A total of 5,900 machine-hours was recorded.

It is the company's policy to close all variances to cost of goods sold on a monthly basis.

Required:

- Compute the following variances for June:
 - Direct materials price and quantity variances.
 - Direct labor rate and efficiency variances.
 - Variable overhead rate and efficiency variances.
- Summarize the variances that you computed in (1) above by showing the net overall favorable or unfavorable variance for the month. What impact did this figure have on the company's income statement? Show computations.
- Pick out the two most significant variances that you computed in (1) above. Explain to Ms. Dunn possible causes of these variances.

PROBLEM 9-13A Variance Analysis in a Hospital [LO2, LO3, LO4]

John Fleming, chief administrator for Valley View Hospital, is concerned about the costs for tests in the hospital's lab. Charges for lab tests are consistently higher at Valley View than at other hospitals and have resulted in many complaints. Also, because of strict regulations on amounts reimbursed for lab tests, payments received from insurance companies and governmental units have not been high enough to cover lab costs.

Mr. Fleming has asked you to evaluate costs in the hospital's lab for the past month. The following information is available:

- Two types of tests are performed in the lab—blood tests and smears. During the past month, 1,800 blood tests and 2,400 smears were performed in the lab.
- Small glass plates are used in both types of tests. During the past month, the hospital purchased 12,000 plates at a cost of \$28,200. This cost is net of a 6% quantity discount. 1,500 of these plates were unused at the end of the month; no plates were on hand at the beginning of the month.
- During the past month, 1,150 hours of labor time were recorded in the lab at a cost of \$13,800.
- The lab's variable overhead cost last month totaled \$7,820.

Valley View Hospital has never used standard costs. By searching industry literature, however, you have determined the following nationwide averages for hospital labs:

Plates: Two plates are required per lab test. These plates cost \$2.50 each and are disposed of after the test is completed.

Labor: Each blood test should require 0.3 hours to complete, and each smear should require 0.15 hours to complete. The average cost of this lab time is \$14 per hour.

Overhead: Overhead cost is based on direct labor-hours. The average rate for variable overhead is \$6 per hour.

Required:

- Compute a materials price variance for the plates purchased last month and a materials quantity variance for the plates used last month.
- For labor cost in the lab:
 - Compute a labor rate variance and a labor efficiency variance.
 - In most hospitals, one-half of the workers in the lab are senior technicians and one-half are assistants. In an effort to reduce costs, Valley View Hospital employs only one-fourth senior technicians and three-fourths assistants. Would you recommend that this policy be continued? Explain.
- Compute the variable overhead rate and efficiency variances. Is there any relation between the variable overhead efficiency variance and the labor efficiency variance? Explain.

PROBLEM 9-14A Setting Standards [LO1]

Danson Company is a chemical manufacturer that supplies various products to industrial users. The company plans to introduce a new chemical solution, called Nysap, for which it needs to develop a standard product cost. The following information is available on the production of Nysap:

- Nysap is made by combining a chemical compound (nyclyn) and a solution (salex), and boiling the mixture. A 20% loss in volume occurs for both the salex and the nyclyn during boiling. After boiling, the mixture consists of 9.6 liters of salex and 12 kilograms of nyclyn per 10-liter batch of Nysap.

CHECK FIGURE

- Materials quantity variance: \$5,250 U;
- Labor rate variance: \$2,300 F



excel

CHECK FIGURE

- Nyclyn: 18.0 kilograms;
- Standard cost: \$97.20

- b. After the boiling process is complete, the solution is cooled slightly before 5 kilograms of protet are added per 10-liter batch of Nysap. The addition of the protet does not affect the total liquid volume. The resulting solution is then bottled in 10-liter containers.
- c. The finished product is highly unstable, and one 10-liter batch out of five is rejected at final inspection. Rejected batches have no commercial value and are thrown out.
- d. It takes a worker 35 minutes to process one 10-liter batch of Nysap. Employees work an eight-hour day, including one hour per day for rest breaks and cleanup.

Required:

- 1. Determine the standard quantity for each of the raw materials needed to produce an acceptable 10-liter batch of Nysap.
- 2. Determine the standard labor time allowed to produce an acceptable 10-liter batch of Nysap.
- 3. Assuming the following costs, prepare a standard cost card for direct materials and direct labor for one acceptable 10-liter batch of Nysap:

Salex.....	\$1.50 per liter
Nycln.....	\$2.80 per kilogram
Protet.....	\$3.00 per kilogram
Direct labor cost	\$9.00 per hour

(CMA, adapted)

CHECK FIGURE

- (1a) Actual cost: \$5.30 per foot;
- (2a) Standard labor rate: \$8

PROBLEM 9-15A Direct Materials and Direct Labor Variances; Computations from Incomplete Data [LO1, LO2, LO3]

Sharp Company manufactures a product for which the following standards have been set:

	Standard Quantity or Hours	Standard Price or Rate	Standard Cost
Direct materials.....	3 feet	\$5 per foot	\$15
Direct labor	? hours	? per hour	?

During March, the company purchased direct materials at a cost of \$55,650, all of which were used in the production of 3,200 units of product. In addition, 4,900 hours of direct labor time were worked on the product during the month. The cost of this labor time was \$36,750. The following variances have been computed for the month:

Direct materials quantity variance	\$4,500 U
Total direct labor variance	\$1,650 F
Direct labor efficiency variance.....	\$800 U

Required:

- 1. For direct materials:
 - a. Compute the actual cost per foot for materials for March.
 - b. Compute the materials price variance and a total variance for materials.
- 2. For direct labor:
 - a. Compute the standard direct labor rate per hour.
 - b. Compute the standard hours allowed for the month's production.
 - c. Compute the standard hours allowed per unit of product.

(Hint: In completing the problem, it may be helpful to move from known to unknown data either by using the columnar format shown in Exhibits 9-4 and 9-6 or by using the variance formulas.)

CHECK FIGURE

- (1) Standard cost: \$31.50 per backpack;
- (3) 2.8 yards per backpack

PROBLEM 9-16A Comprehensive Variance Analysis [LO1, LO2, LO3, LO4]

Highland Company produces a lightweight backpack that is popular with college students. Standard variable costs relating to a single backpack are given on the following page:



	Standard Quantity or Hours	Standard Price or Rate	Standard Cost
Direct materials.....	?	\$6 per yard	\$?
Direct labor	?	?	?
Variable manufacturing overhead.....	?	\$3 per direct labor-hour	?
Total standard cost			<u>\$?</u>

Overhead is applied to production on the basis of direct labor-hours. During March, 1,000 backpacks were manufactured and sold. Selected information relating to the month's production is given below:

	Materials Used	Direct Labor	Variable Manufacturing Overhead
Total standard cost allowed*	\$16,800	\$10,500	\$4,200
Actual costs incurred	\$15,000	?	\$3,600
Direct materials price variance	?		
Direct materials quantity variance	\$1,200 U		
Direct labor rate variance		?	
Direct labor efficiency variance.....		?	
Variable overhead rate variance.....			?
Variable overhead efficiency variance			?

*For the month's production.

The following additional information is available for March's production:

Actual direct labor-hours.....	1,500
Standard overhead rate per direct labor-hour	\$3.00
Standard price of one yard of materials.....	\$6.00
Difference between standard and actual cost per backpack produced during March.....	\$0.15 F

Required:

1. What is the standard cost of a single backpack?
2. What was the actual cost per backpack produced during March?
3. How many yards of material are required at standard per backpack?
4. What was the direct materials price variance for March?
5. What is the standard direct labor rate per hour?
6. What was the direct labor rate variance for March? The direct labor efficiency variance?
7. What was the variable overhead rate variance for March? The variable overhead efficiency variance?
8. Prepare a standard cost card for one backpack.

PROBLEM 9-17A Developing Standard Costs [LO1]

ColdKing Company is a small producer of fruit-flavored frozen desserts. For many years, ColdKing's products have had strong regional sales on the basis of brand recognition; however, other companies have begun marketing similar products in the area, and price competition has become increasingly intense. John Wakefield, the company's controller, is planning to implement a standard cost system for ColdKing and has gathered considerable information from his co-workers on production and material requirements for ColdKing's products. Wakefield believes that the use of standard costing will allow ColdKing to improve cost control and make better pricing decisions.

ColdKing's most popular product is raspberry sherbet. The sherbet is produced in 10-gallon batches, and each batch requires 6 quarts of good raspberries. The fresh raspberries are sorted by hand before they

CHECK FIGURE

(1) Standard cost: \$30.20 per batch



enter the production process. Because of imperfections in the raspberries and normal spoilage, 1 quart of berries is discarded for every 4 quarts of acceptable berries. Three minutes is the standard direct labor time for the sorting that is required to obtain 1 quart of acceptable raspberries. The acceptable raspberries are then blended with the other ingredients; blending requires 12 minutes of direct labor time per batch. After blending, the sherbet is packaged in quart containers. Wakefield has gathered the following pricing information:

- a. ColdKing purchases raspberries at a cost of \$0.80 per quart. All other ingredients cost a total of \$0.45 per gallon of sherbet.
- b. Direct labor is paid at the rate of \$9.00 per hour.
- c. The total cost of direct material and direct labor required to package the sherbet is \$0.38 per quart.

Required:

1. Develop the standard cost for the direct cost components (materials, labor, and packaging) of a 10-gallon batch of raspberry sherbet. The standard cost should identify the standard quantity, standard rate, and standard cost per batch for each direct cost component of a batch of raspberry sherbet.
2. As part of the implementation of a standard cost system at ColdKing, John Wakefield plans to train those responsible for maintaining the standards on how to use variance analysis. Wakefield is particularly concerned with the causes of unfavorable variances.
 - a. Discuss possible causes of unfavorable direct materials price variances and identify the individual(s) who should be held responsible for these variances.
 - b. Discuss possible causes of unfavorable direct labor efficiency variances and identify the individual(s) who should be held responsible for these variances.

(CMA, adapted)

BUILDING YOUR SKILLS



ETHICS CASE [LO1]

Stacy Cummins, the newly hired controller at Merced Home Products, Inc., was disturbed by what she had discovered about the new standard costs at the Home Security Division. In looking over the past several years of quarterly income statements at the Home Security Division, she noticed that the first-quarter profits were always poor, the second-quarter profits were slightly better, the third-quarter profits were again slightly better, and the fourth quarter always ended with a spectacular performance in which the Home Security Division managed to meet or exceed its target profit for the year. She also was concerned to find letters from the company's external auditors to top management warning about an unusual use of standard costs at the Home Security Division.

When Ms. Cummins ran across these letters, she asked the assistant controller, Gary Farber, if he knew what was going on at the Home Security Division. Gary said that it was common knowledge in the company that the vice president in charge of the Home Security Division, Preston Lansing, had rigged the standards at his division in order to produce the same quarterly income pattern every year. According to company policy, variances are taken directly to the income statement as an adjustment to cost of goods sold.

Favorable variances have the effect of increasing net operating income, and unfavorable variances have the effect of decreasing net operating income. Lansing had rigged the standards so that there were always large favorable variances. Company policy was a little vague about when these variances have to be reported on the divisional income statements. While the intent was clearly to recognize variances on the income statement in the period in which they arise, nothing in the company's accounting manuals actually explicitly required this. So for many years Lansing had followed a practice of saving up the favorable variances and using them to create a nice smooth pattern of growing profits in the first three quarters, followed by a big "Christmas present" of an extremely good fourth quarter. (Financial reporting regulations forbid carrying variances forward from one year to the next on the annual audited financial statements, so all of the variances must appear on the divisional income statement by the end of the year.)

Ms. Cummins was concerned about these revelations and attempted to bring up the subject with the president of Merced Home Products but was told that "we all know what Lansing's doing, but as long as he continues to turn in such good reports, don't bother him." When Ms. Cummins asked if the board of directors was aware of the situation, the president somewhat testily replied, "Of course they are aware."

Required:

1. How did Preston Lansing probably "rig" the standard costs—are the standards set too high or too low? Explain.
2. Should Preston Lansing be permitted to continue his practice of managing reported profits?
3. What should Stacy Cummins do in this situation?

COMMUNICATING IN PRACTICE [LO1]

Make an appointment to meet with the manager of an auto repair shop that uses standards. In most cases, this would be an auto repair shop that is affiliated with a national chain such as Firestone or Sears or the service department of a new-car dealer.

**Required:**

At the scheduled meeting, find out the answers to the following questions and write a memo to your instructor describing the information obtained during your meeting.

1. How are standards set?
2. Are standards practical or ideal?
3. Is the actual time taken to complete a task compared to the standard time?
4. What are the consequences of unfavorable variances? Of favorable variances?
5. Do the standards and variances create any potential problems?

TEAMWORK IN ACTION [LO1]

Terry Travers is the manufacturing supervisor of Aurora Manufacturing Company, which produces a variety of plastic products. Some of these products are standard items that are listed in the company's catalog, while others are made to customer specifications. Each month, Travers receives a performance report showing the budget for the month, the actual activity, and the variance between budget and actual. Part of Travers's annual performance evaluation is based on his department's performance against budget. Aurora's purchasing manager, Sally Christensen, also receives monthly performance reports and she, too, is evaluated in part on the basis of these reports.



The monthly reports for June had just been distributed when Travers met Christensen in the hallway outside their offices. Scowling, Travers began the conversation, "I see we have another set of monthly performance reports hand-delivered by that not very nice junior employee in the budget office. He seemed pleased to tell me that I'm in trouble with my performance again."

Christensen: I got the same treatment. All I ever hear about are the things I haven't done right. Now I'll have to spend a lot of time reviewing the report and preparing explanations. The worst part is that it's now the 21st of July so the information is almost a month old, and we have to spend all this time on history.

Travers: My biggest gripe is that our production activity varies a lot from month to month, but we're given an annual budget that's written in stone. Last month we were shut down for three days when a strike delayed delivery of the basic ingredient used in our plastic formulation, and we had already exhausted our inventory. You know about that problem, though, because we asked you to call all over the country to find an alternate source of supply. When we got what we needed on a rush basis, we had to pay more than we normally do.

Christensen: I expect problems like that to pop up from time to time—that's part of my job—but now we'll both have to take a careful look at our reports to see where the charges are reflected for that rush order. Every month I spend more time making sure I should be charged for each item reported than I do making plans for my department's daily work. It's really frustrating to see charges for things I have no control over.

Travers: The way we get information doesn't help, either. I don't get copies of the reports you get, yet a lot of what I do is affected by your department, and by most of the other departments we have. Why do the budget and accounting people assume that I should be told only about my operations even though the president regularly gives us pep talks about how we all need to work together as a team?

Christensen: I seem to get more reports than I need, and I am never asked to comment on them until top management calls me on the carpet about my department's shortcomings. Do you ever hear comments when your department shines?

Travers: I guess they don't have time to review the good news. One of my problems is that all the reports are in dollars and cents. I work with people, machines, and materials. I need information to help me *this* month to solve *this* month's problems—not another report of the dollars expended *last* month or the month before.

Required:

Your team should discuss and then respond to the following questions. All team members should agree with and understand the answers and be prepared to report on those answers in class. (Each teammate can assume responsibility for a different part of the presentation.)

1. On the basis of the conversation between Terry Travers and Sally Christensen, describe the likely motivation and behavior of these two employees as a result of the standard cost and variance reporting system that is used by Aurora Manufacturing Company.
2. List the recommendations that your team would make to Aurora Manufacturing Company to enhance employee motivation as it relates to the company's standard cost and variance reporting system.

(CMA, adapted)

APPENDIX 9A: PREDETERMINED OVERHEAD RATES AND OVERHEAD ANALYSIS IN A STANDARD COSTING SYSTEM

LEARNING OBJECTIVE 5

Compute and interpret the fixed overhead budget and volume variances.

In this appendix, we will investigate how the predetermined overhead rates that we discussed in the job-order costing chapter earlier in the book can be used in a standard costing system. Throughout this appendix, we assume that an absorption costing system is used in which *all* manufacturing costs—both fixed and variable—are included in product costs.



Predetermined Overhead Rates

The data in Exhibit 9A-1 pertain to MicroDrive Corporation, a company that produces miniature electric motors. Note that the company budgeted for 50,000 machine-hours based on production of 25,000 motors. At this level of activity, the budgeted variable manufacturing overhead was \$75,000 and the budgeted fixed manufacturing overhead was \$300,000.

Recall from the job-order costing chapter that the following formula is used to set the predetermined overhead rate at the beginning of the period:

$$\text{Predetermined overhead rate} = \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total amount of the allocation base}}$$

The estimated total amount of the allocation base in the formula for the predetermined overhead rate is called the **denominator activity**.

As discussed in the job-order costing chapter, once the predetermined overhead rate has been determined, it remains unchanged throughout the period, even if the actual level of activity differs from what was estimated. Consequently, the amount of overhead applied to each unit of product is the same regardless of when it is produced during the period.

MicroDrive Corporation uses budgeted machine-hours as its denominator activity in the predetermined overhead rate. Consequently, the company's predetermined overhead rate would be computed as follows:

$$\text{Predetermined overhead rate} = \frac{\$375,000}{50,000 \text{ MHs}} = \$7.50 \text{ per MH}$$

EXHIBIT 9A-1
MicroDrive Corporation Data

Budgeted production	25,000 motors
Standard machine-hours per motor	2 machine-hours per motor
Budgeted machine-hours (2 machine-hours per motor × 25,000 motors).....	50,000 machine-hours
Actual production	20,000 motors
Standard machine-hours allowed for the actual production (2 machine-hours per motor × 20,000 motors).....	40,000 machine-hours
Actual machine-hours	42,000 machine-hours
Budgeted variable manufacturing overhead.....	\$75,000
Budgeted fixed manufacturing overhead.....	\$300,000
Total budgeted manufacturing overhead.....	\$375,000
Actual variable manufacturing overhead	\$71,000
Actual fixed manufacturing overhead	\$308,000
Total actual manufacturing overhead	\$379,000

This predetermined overhead rate can be broken down into its variable and fixed components as follows:

$$\text{Variable component of the predetermined overhead rate} = \frac{\$75,000}{50,000 \text{ MHs}} = \$1.50 \text{ per MH}$$

$$\text{Fixed component of the predetermined overhead rate} = \frac{\$300,000}{50,000 \text{ MHs}} = \$6.00 \text{ per MH}$$

For every standard machine-hour recorded, work in process is charged with \$7.50 of manufacturing overhead, of which \$1.50 represents variable manufacturing overhead and \$6.00 represents fixed manufacturing overhead. In total, MicroDrive Corporation would apply \$300,000 of overhead to work in process as shown below:

$$\begin{aligned} \text{Overhead applied} &= \text{Predetermined overhead rate} \times \text{Standard hours allowed for the actual output} \\ &= \$7.50 \text{ per machine-hour} \times 40,000 \text{ machine-hours} \\ &= \$300,000 \end{aligned}$$

Overhead Application in a Standard Cost System

To understand fixed overhead variances, we first have to understand how overhead is applied to work in process in a standard cost system. Recall that in the job-order costing chapter we applied overhead to work in process on the basis of the actual level of activity. This procedure was correct because at the time we were dealing with a normal cost system.¹ However, we are now dealing with a standard cost system. In such a system, overhead is applied to work in process on the basis of the *standard hours allowed for the actual output of the period* rather than on the basis of the actual number of hours worked. Exhibit 9A-2 illustrates this point. In a standard cost system, every unit of a particular product is charged with the same amount of overhead cost, regardless of how much time the unit actually requires for processing.

Normal Cost System Manufacturing Overhead		Standard Cost System Manufacturing Overhead	
Actual overhead costs incurred.	Applied overhead costs: Actual hours × Pre-determined overhead rate.	Actual overhead costs incurred.	Applied overhead costs: Standard hours allowed for actual output × Pre-determined overhead rate.
Underapplied or overapplied overhead		Underapplied or overapplied overhead	

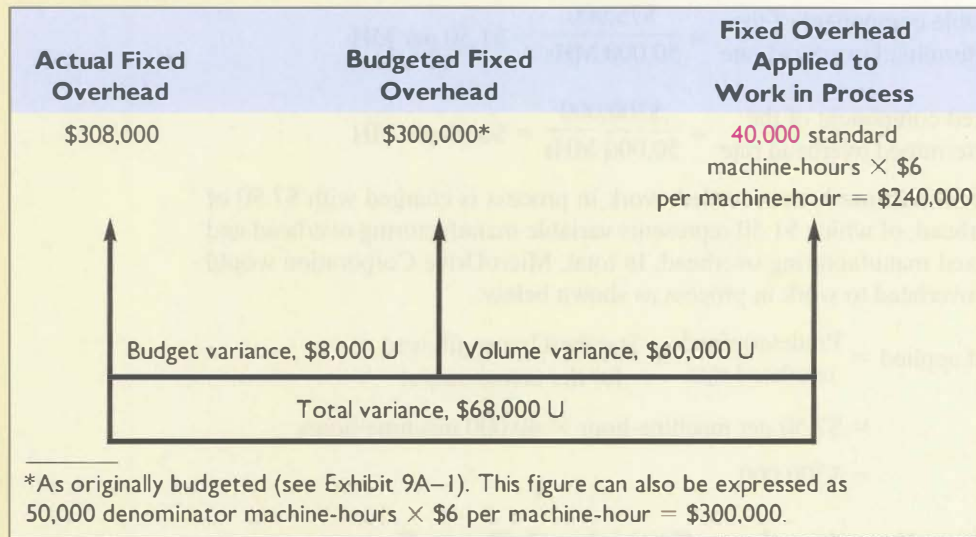
EXHIBIT 9A-2
Applied Overhead Costs:
Normal Cost System versus
Standard Cost System

Budget Variance

Two fixed manufacturing overhead variances are computed in a standard costing system—a *budget variance* and a *volume variance*. These variances are computed in Exhibit 9A-3. The **budget variance** is simply the difference between the actual fixed manufacturing overhead and the budgeted fixed manufacturing overhead for the period. The formula is:

$$\text{Budget variance} = \text{Actual fixed overhead} - \text{Budgeted fixed overhead}$$

¹Normal cost systems are discussed on page 83 in the job-order costing chapter (Chapter 2).

EXHIBIT 9A-3 Computation of the Fixed Overhead Variances

If the actual fixed overhead cost exceeds the budgeted fixed overhead cost, the budget variance is labeled unfavorable. If the actual fixed overhead cost is less than the budgeted fixed overhead cost, the budget variance is labeled favorable.

Applying the formula to the MicroDrive Corporation data, the budget variance is computed as follows:

$$\text{Budget variance} = \$308,000 - \$300,000 = \$8,000 \text{ U}$$

According to the budget, the fixed manufacturing overhead should have been \$300,000, but it was actually \$308,000. Because the actual cost exceeds the budget by \$8,000, the variance is labeled as unfavorable; however, this label does not automatically signal ineffective managerial performance. For example, this variance may be the result of waste and inefficiency, or it may be due to an unforeseen yet prudent investment in fixed overhead resources that improves product quality or manufacturing cycle efficiency.

Volume Variance

The **volume variance** is defined by the following formula:

$$\text{Volume variance} = \text{Budgeted fixed overhead} - \text{Fixed overhead applied to work in process}$$

When the budgeted fixed manufacturing overhead exceeds the fixed manufacturing overhead applied to work in process, the volume variance is labeled as unfavorable. When the budgeted fixed manufacturing overhead is less than the fixed manufacturing overhead applied to work in process, the volume variance is labeled as favorable. As we shall see, caution is advised when interpreting this variance.

To understand the volume variance, we need to understand how fixed manufacturing overhead is applied to work in process in a standard costing system. As discussed earlier, fixed manufacturing overhead is applied to work in process on the basis of the standard hours allowed for the actual output of the period. In the case of MicroDrive Corporation, the company produced 20,000 motors and the standard for each motor is 2 machine-hours. Therefore, the standard hours allowed for the actual output is 40,000 machine-hours (= 20,000 motors × 2 machine-hours). As shown in Exhibit 9A-3, the

predetermined fixed manufacturing overhead rate of \$6.00 per machine-hour is multiplied by the 40,000 standard machine-hours allowed for the actual output to arrive at \$240,000 of fixed manufacturing overhead applied to work in process. Another way to think of this is that the standard for each motor is 2 machine-hours. Because the predetermined fixed manufacturing overhead rate is \$6.00 per machine-hour, each motor is assigned \$12.00 (= 2 machine-hours × \$6.00 per machine-hour) of fixed manufacturing overhead. Consequently, a total of \$240,000 of fixed manufacturing overhead is applied to the 20,000 motors that are actually produced. Under either explanation, the volume variance according to the formula is:

$$\text{Volume variance} = \$300,000 - \$240,000 = \$60,000 \text{ U}$$

The key to interpreting the volume variance is to understand that it depends on the difference between the hours used in the denominator to compute the predetermined overhead rate and the standard hours allowed for the actual output of the period. While it is not obvious, the volume variance can also be computed using the following formula:

$$\text{Volume variance} = \text{Fixed component of the predetermined overhead rate} \times \left(\frac{\text{Denominator hours} - \text{Standard hours allowed for the actual output}}{\text{Denominator hours}} \right)$$

In the case of MicroDrive Corporation, the volume variance can be computed using this formula as follows:

$$\begin{aligned} \text{Volume variance} &= \$6.00 \text{ per machine-hour} \times \left(\frac{50,000 \text{ machine-hours} - 40,000 \text{ machine-hours}}{50,000 \text{ machine-hours}} \right) \\ &= \$6.00 \text{ per machine-hour} \times (10,000 \text{ machine-hours}) \\ &= \$60,000 \text{ U} \end{aligned}$$

Note that this agrees with the volume variance computed using the earlier formula.

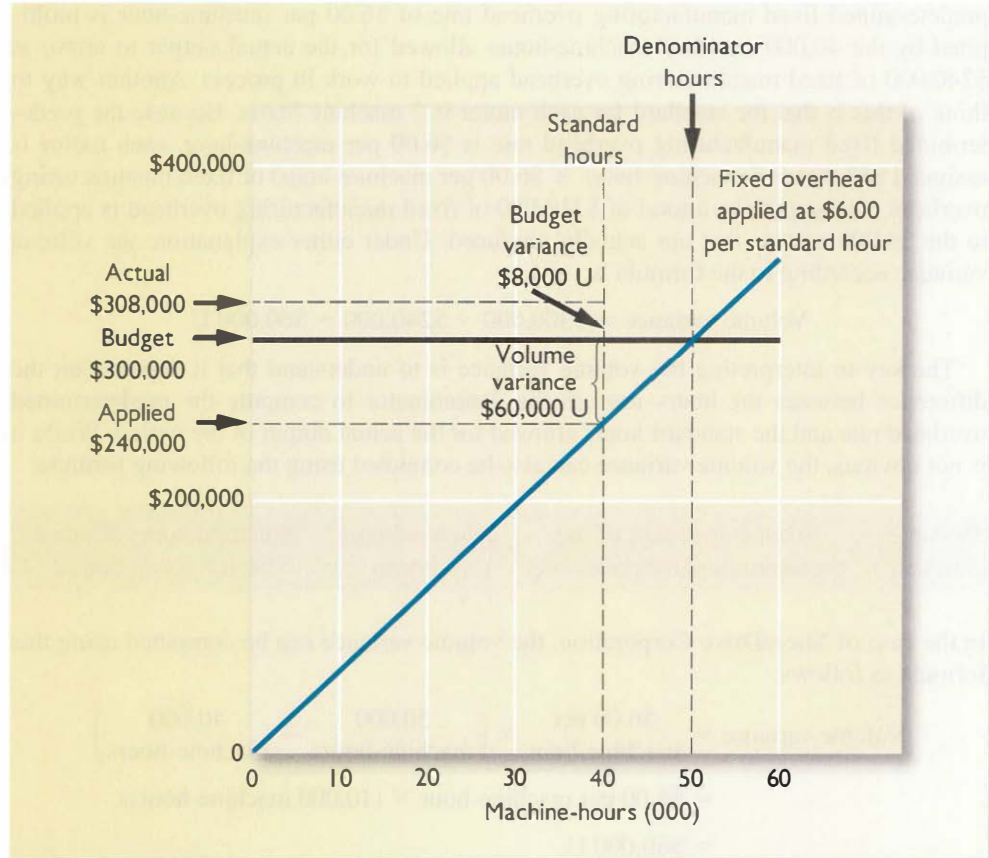
Focusing on this new formula, if the denominator hours exceed the standard hours allowed for the actual output, the volume variance is unfavorable. If the denominator hours are less than the standard hours allowed for the actual output, the volume variance is favorable. Stated differently, the volume variance is unfavorable if the actual level of activity is less than expected. The volume variance is favorable if the actual level of activity is greater than expected. It is important to note that the volume variance does not measure overspending or underspending. A company should incur the same dollar amount of fixed overhead cost regardless of whether the period's activity was above or below the planned (denominator) level.

The volume variance is often viewed as a measure of the utilization of facilities. If the standard hours allowed for the actual output are greater than (less than) the denominator hours, it signals efficient (inefficient) usage of facilities. However, other measures of utilization—such as the percentage of capacity utilized—are easier to compute and understand. Perhaps a better interpretation of the volume variance is that it is the error that occurs when the level of activity is incorrectly estimated and the costing system assumes fixed costs behave as if they are variable. This interpretation may be clearer in the next section that graphically analyzes the fixed manufacturing overhead variances.

Graphic Analysis of Fixed Overhead Variances

Exhibit 9A-4 shows a graphic analysis that offers insights into the fixed overhead budget and volume variances. As shown in the graph, fixed overhead cost is applied to work in process at the predetermined rate of \$6.00 for each standard hour of activity. (The applied-cost line is the upward-sloping line on the graph.) Because a denominator level of 50,000 machine-hours was used in computing the \$6.00 rate, the applied-cost line crosses the budget-cost line at exactly 50,000 machine-hours. If the denominator hours

EXHIBIT 9A-4
Graphic Analysis of Fixed
Overhead Variances



and the standard hours allowed for the actual output are the same, there is no volume variance. It is only when the standard hours differ from the denominator hours that a volume variance arises.

In MicroDrive's case, the standard hours allowed for the actual output (40,000 hours) are less than the denominator hours (50,000 hours). The result is an unfavorable volume variance because less cost was applied to production than was originally budgeted. If the situation had been reversed and the standard hours allowed for the actual output had exceeded the denominator hours, then the volume variance on the graph would have been favorable.

Cautions in Fixed Overhead Analysis

A volume variance for fixed overhead arises because when applying the costs to work in process, we act *as if* the fixed costs are variable. The graph in Exhibit 9A-4 illustrates this point. Notice from the graph that fixed overhead costs are applied to work in process at a rate of \$6 per hour *as if* they are variable. Treating these costs as if they are variable is necessary for product costing purposes, but some real dangers lurk here. Managers can easily be misled into thinking that fixed costs are *in fact* variable.

Keep clearly in mind that fixed overhead costs come in large chunks. Expressing fixed costs on a unit or per hour basis, though necessary for product costing for external reports, is artificial. Increases or decreases in activity in fact have no effect on total fixed costs within the relevant range of activity. Even though fixed costs are expressed on a unit or per hour basis, they are *not* proportional to activity. In a sense, the volume variance is the error that occurs as a result of treating fixed costs as variable costs in the costing system.

Reconciling Overhead Variances and Underapplied or Overapplied Overhead

In a standard cost system, the underapplied or overapplied overhead for a period equals the sum of the overhead variances. To see this, we will return to the MicroDrive Corporation example.

As discussed earlier, in a standard cost system, overhead is applied to work in process on the basis of the standard hours allowed for the actual output of the period. The following table shows how the underapplied or overapplied overhead for MicroDrive is computed.

Predetermined overhead rate (a)	\$7.50 per machine-hour
Standard hours allowed for the actual output [Exhibit 9A-1] (b)	40,000 machine-hours
Manufacturing overhead applied (a) × (b)	\$300,000
Actual manufacturing overhead [Exhibit 9A-1]	\$379,000
Manufacturing overhead underapplied or overapplied	\$79,000 underapplied

We have already computed the budget variance and the volume variance for this company. We will also need to compute the variable manufacturing overhead variances. The data for these computations are contained in Exhibit 9A-1. Recalling the formulas for the variable manufacturing overhead variances from earlier in this chapter, we can compute the variable overhead rate and efficiency variances as follows:

$$\begin{aligned} \text{Variable overhead rate variance} &= (AH \times AR) - (AH \times SR) \\ &= (\$71,000) - \left(\begin{array}{l} 42,000 \\ \text{machine-hours} \end{array} \times \begin{array}{l} \$1.50 \text{ per} \\ \text{machine-hour} \end{array} \right) \\ &= \$71,000 - \$63,000 = \$8,000 \text{ U} \end{aligned}$$

$$\begin{aligned} \text{Variable overhead efficiency variance} &= (AH \times SR) - (SH \times SR) \\ &= (\$63,000) - \left(\begin{array}{l} 40,000 \\ \text{machine-hours} \end{array} \times \begin{array}{l} \$1.50 \text{ per} \\ \text{machine-hour} \end{array} \right) \\ &= \$63,000 - \$60,000 = \$3,000 \text{ U} \end{aligned}$$

We can now compute the sum of all of the overhead variances as follows:

Variable overhead rate variance	\$8,000 U
Variable overhead efficiency variance	\$3,000 U
Fixed overhead budget variance	\$8,000 U
Fixed overhead volume variance	\$60,000 U
Total of the overhead variances	<u>\$79,000 U</u>

Note that the total of the overhead variances is \$79,000, which equals the underapplied overhead of \$79,000 shown in the top half of the page. In general, if the overhead is underapplied, the total of the standard cost overhead variances is unfavorable. If the overhead is overapplied, the total of the standard cost overhead variances is favorable.

APPENDIX 9A SUMMARY

LO5 Compute and interpret the fixed overhead budget and volume variances.

The fixed overhead budget variance is the difference between the actual fixed overhead and the budgeted fixed overhead of the period. If actual fixed overhead exceeds budgeted fixed overhead, the budget variance is unfavorable. If actual fixed overhead is less than budgeted fixed overhead, the budget variance is favorable.

The fixed overhead volume variance is the difference between the budgeted fixed overhead and the fixed overhead applied to work in process using the predetermined overhead rate. If budgeted fixed overhead exceeds the fixed overhead applied to work in process, the volume variance is labeled as unfavorable. If budgeted fixed overhead is less than the fixed overhead applied to work in process, the volume variance is labeled as favorable. The volume variance does not measure overspending or underspending; basically, it is the error that occurs when the level of activity is incorrectly estimated at the beginning of the period.

APPENDIX 9A GLOSSARY

Budget variance The difference between the actual fixed overhead costs incurred and the budgeted fixed overhead costs in the flexible budget. (p. 435)

Denominator activity The level of activity used to compute the predetermined overhead rate. (p. 434)

Volume variance The variance that arises whenever the standard hours allowed for the actual output of a period are different from the denominator activity level that was used to compute the predetermined overhead rate. It is computed by multiplying the fixed component of the predetermined overhead rate by the difference between the denominator hours and the standard hours allowed for the actual output. (p. 436)

APPENDIX 9A EXERCISES AND PROBLEMS



BRIEF EXERCISE 9A-1 Applying Overhead in a Standard Costing System [LO5]

Privack Corporation has a standard cost system in which it applies overhead to products based on the standard direct labor-hours allowed for the actual output of the period. Data concerning the most recent year appear below:

Variable overhead cost per direct labor-hour	\$2.00
Total fixed overhead cost per year	\$250,000
Budgeted standard direct labor-hours (denominator level of activity)	40,000
Actual direct labor-hours	39,000
Standard direct labor-hours allowed for the actual output	38,000

Required:

1. Compute the predetermined overhead rate for the year.
2. Determine the amount of overhead that would be applied to the output of the period.

BRIEF EXERCISE 9A-2 Fixed Overhead Variances [LO5]

Primara Corporation has a standard cost system in which it applies overhead to products based on the standard direct labor-hours allowed for the actual output of the period. Data concerning the most recent year appear below:

Total budgeted fixed overhead cost for the year	\$250,000
Actual fixed overhead cost for the year	\$254,000
Budgeted standard direct labor-hours (denominator level of activity)	25,000
Actual direct labor-hours	27,000
Standard direct labor-hours allowed for the actual output	26,000

Required:

1. Compute the fixed portion of the predetermined overhead rate for the year.
2. Compute the fixed overhead budget variance and volume variance.

EXERCISE 9A-3 Predetermined Overhead Rate [LO1, LO5]

Operating at a normal level of 30,000 direct labor-hours, Lasser Company produces 10,000 units of product each period. The direct labor wage rate is \$12 per hour. Two and one-half yards of direct materials go into each unit of product; the material costs \$8.60 per yard. Variable manufacturing overhead should be \$1.90 per standard direct labor-hour. Fixed manufacturing overhead should be \$168,000 per period.

Required:

1. Using 30,000 direct labor-hours as the denominator activity, compute the predetermined overhead rate and break it down into variable and fixed elements.
2. Complete the standard cost card below for one unit of product:

Direct materials, 2.5 yards at \$8.60 per yard.....	\$21.50
Direct labor, ?	?
Variable manufacturing overhead, ?.....	?
Fixed manufacturing overhead, ?.....	?
Total standard cost per unit.....	<u>\$?</u>

EXERCISE 9A-4 Predetermined Overhead Rate; Overhead Variances [LO4, LO5]

Norwall Company's variable manufacturing overhead should be \$3.00 per standard machine-hour and its fixed manufacturing overhead should be \$300,000 per period.

The following information is available for a recent period:

- a. The denominator activity of 60,000 machine-hours is used to compute the predetermined overhead rate.
- b. At the 60,000 standard machine-hours level of activity, the company should produce 40,000 units of product.
- c. The company's actual operating results were:

Number of units produced	42,000
Actual machine-hours.....	64,000
Actual variable overhead cost	\$185,600
Actual fixed overhead cost	\$302,400

Required:

1. Compute the predetermined overhead rate and break it down into variable and fixed cost elements.
2. Compute the standard hours allowed for the actual production.
3. Compute the variable overhead rate and efficiency variances and the fixed overhead budget and volume variances.

EXERCISE 9A-5 Fixed Overhead Variances [LO5]

Selected operating information on three different companies for a recent year is given below:

	Company		
	A	B	C
Full-capacity machine-hours	10,000	18,000	20,000
Budgeted machine-hours*	9,000	17,000	20,000
Actual machine-hours	9,000	17,800	19,000
Standard machine-hours allowed for actual production	9,500	16,000	20,000

*Denominator activity for computing the predetermined overhead rate.



Required:

For each company, state whether the company would have a favorable or unfavorable volume variance and why.

PROBLEM 9A-8A Comprehensive Standard Cost Variances [LO1, LO2, LO3, LO4, LO5]

Flandro Company uses a standard cost system and sets predetermined overhead rates on the basis of direct labor-hours. The following data are taken from the company's budget for the current year:

Denominator activity (direct labor-hours)	5,000
Variable manufacturing overhead cost	\$25,000
Fixed manufacturing overhead cost	\$59,000

The standard cost card for the company's only product is given below:

Direct materials, 3 yards at \$4.40 per yard	\$13.20
Direct labor, 1 hour at \$12 per hour	12.00
Manufacturing overhead, 140% of direct labor cost	16.80
Standard cost per unit	<u>\$42.00</u>

During the year, the company produced 6,000 units of product and incurred the following costs:

Materials purchased, 24,000 yards at \$4.80 per yard	\$115,200
Materials used in production (in yards)	18,500
Direct labor cost incurred, 5,800 hours at \$13 per hour ...	\$75,400
Variable manufacturing overhead cost incurred	\$29,580
Fixed manufacturing overhead cost incurred	\$60,400

Required:

1. Redo the standard cost card in a clearer, more usable format by detailing the variable and fixed overhead cost elements.
2. Prepare an analysis of the variances for direct materials and direct labor for the year.
3. Prepare an analysis of the variances for variable and fixed overhead for the year.
4. What effect, if any, does the choice of a denominator activity level have on unit standard costs? Is the volume variance a controllable variance from a spending point of view? Explain.

PROBLEM 9A-9A Comprehensive Standard Cost Variances [LO2, LO3, LO4, LO5]

"Wonderful! Not only did our salespeople do a good job in meeting the sales budget this year, but our production people did a good job in controlling costs as well," said Kim Clark, president of Martell Company. "Our \$18,300 overall manufacturing cost variance is only 1.2% of the \$1,536,000 standard cost of products made during the year. That's well within the 3% parameter set by management for acceptable variances. It looks like everyone will be in line for a bonus this year."

The company produces and sells a single product. The standard cost card for the product follows:

Standard Cost Card—per Unit of Product	
Direct materials, 2 feet at \$8.45 per foot	\$16.90
Direct labor, 1.4 direct labor hours at \$16 per direct labor-hour	22.40
Variable overhead, 1.4 direct labor-hours at \$2.50 per direct labor-hour	3.50
Fixed overhead, 1.4 direct labor-hours at \$6 per direct labor-hour	8.40
Standard cost per unit	<u>\$51.20</u>

The following additional information is available for the year just completed:

- a. The company manufactured 30,000 units of product during the year.
- b. A total of 64,000 feet of material was purchased during the year at a cost of \$8.55 per foot. All of this material was used to manufacture the 30,000 units. There were no beginning or ending inventories for the year.

CHECK FIGURE

- (1) Materials quantity variance: \$2,200 U;
- (2) Labor rate variance: \$1,000 U;
- (3) Volume variance: \$11,800 F



excel



CHECK FIGURE

- (3a) Efficiency variance: \$3,750 U;
- (3b) Volume variance: \$42,000 F

- c. The company worked 43,500 direct labor-hours during the year at a direct labor cost of \$15.80 per hour.
- d. Overhead is applied to products on the basis of standard direct labor-hours. Data relating to manufacturing overhead costs follow:

Denominator activity level (direct labor-hours)	35,000
Budgeted fixed overhead costs (from the overhead flexible budget)	\$210,000
Actual variable overhead costs incurred.....	\$108,000
Actual fixed overhead costs incurred.....	\$211,800

Required:

1. Compute the direct materials price and quantity variances for the year.
2. Compute the direct labor rate and efficiency variances for the year.
3. For manufacturing overhead compute:
 - a. The variable overhead rate and efficiency variances for the year.
 - b. The fixed overhead budget and volume variances for the year.
4. Total the variances you have computed, and compare the net amount with the \$18,300 mentioned by the president. Do you agree that bonuses should be given to everyone for good cost control during the year? Explain.

CHECK FIGURE

(3) Rate variance:
 PZ3,000 U: Budget
 variance: PZ600 F



PROBLEM 9A-10A Applying Overhead; Overhead Variances [LO4, LO5]

Chilczuk, S.A., of Gdansk, Poland, is a major producer of classic Polish sausage. The company uses a standard cost system to help control costs. Manufacturing overhead is applied to production on the basis of standard direct labor-hours. According to the company's flexible budget, the following manufacturing overhead costs should be incurred at an activity level of 35,000 labor-hours (the denominator activity level):

Variable manufacturing overhead cost	PZ 87,500
Fixed manufacturing overhead cost	210,000
Total manufacturing overhead cost	<u>PZ297,500</u>

The currency in Poland is the zloty, which is denoted here by PZ.

During the most recent year, the following operating results were recorded:

Activity:	
Actual labor-hours worked	30,000
Standard labor-hours allowed for output.....	32,000
Cost:	
Actual variable manufacturing overhead cost incurred	PZ78,000
Actual fixed manufacturing overhead cost incurred.....	PZ209,400

At the end of the year, the company's Manufacturing Overhead account contained the following data:

Manufacturing Overhead			
Actual	287,400	Applied	272,000
	15,400		

Management would like to determine the cause of the PZ15,400 underapplied overhead.

Required:

1. Compute the predetermined overhead rate. Break the rate down into variable and fixed cost elements.
2. Show how the PZ272,000 Applied figure in the Manufacturing Overhead account was computed.
3. Analyze the PZ15,400 underapplied overhead figure in terms of the variable overhead rate and efficiency variances and the fixed overhead budget and volume variances.
4. Explain the meaning of each variance that you computed in (3) above.

PROBLEM 9A-11A Applying Overhead; Overhead Variances [LO1, LO4, LOS]

Lane Company manufactures a single product that requires a great deal of hand labor. Overhead cost is applied on the basis of standard direct labor-hours. Variable manufacturing overhead should be \$2 per standard direct labor-hour and fixed manufacturing overhead should be \$480,000 per year.

The company's product requires 3 pounds of material that has a standard cost of \$7 per pound and 1.5 hours of direct labor time that has a standard rate of \$12 per hour.

The company planned to operate at a denominator activity level of 60,000 direct labor-hours and to produce 40,000 units of product during the most recent year. Actual activity and costs for the year were as follows:

Number of units produced	42,000
Actual direct labor-hours worked	65,000
Actual variable manufacturing overhead cost incurred.....	\$123,500
Actual fixed manufacturing overhead cost incurred.....	\$483,000

CHECK FIGURE

- (2) Standard cost: \$54 per unit;
- (4) Volume variance: \$24,000 F



Required:

1. Compute the predetermined overhead rate for the year. Break the rate down into variable and fixed elements.
2. Prepare a standard cost card for the company's product; show the details for all manufacturing costs on your standard cost card.
3. Do the following:
 - a. Compute the standard direct labor-hours allowed for the year's production.
 - b. Complete the following Manufacturing Overhead T-account for the year:

Manufacturing Overhead	
?	?
?	?

4. Determine the reason for any underapplied or overapplied overhead for the year by computing the variable overhead rate and efficiency variances and the fixed overhead budget and volume variances.
5. Suppose the company had chosen 65,000 direct labor-hours as the denominator activity rather than 60,000 hours. State which, if any, of the variances computed in (4) above would have changed, and explain how the variance(s) would have changed. No computations are necessary.

APPENDIX 9B: JOURNAL ENTRIES TO RECORD VARIANCES

Although standard costs and variances can be computed and used by management without being formally entered into the accounting records, many organizations prefer to make formal journal entries. Formal entry tends to give variances a greater emphasis than informal, off-the-record computations. This emphasis signals management's desire to keep costs within the limits that have been set. In addition, formal use of standard costs

LEARNING OBJECTIVE 6

Prepare journal entries to record standard costs and variances.



simplifies the bookkeeping process enormously. Inventories and cost of goods sold can be valued at their standard costs—eliminating the need to keep track of the actual cost of each unit.

Direct Materials Variances

To illustrate the journal entries needed to record standard cost variances, we will return to the data contained in the review problem at the end of the chapter. The entry to record the purchase of direct materials would be as follows:

Raw Materials (18,000 ounces at \$0.50 per ounce).....	9,000	
Materials Price Variance (18,000 ounces at \$0.10 per ounce U).....	1,800	
Accounts Payable (18,000 ounces at \$0.60 per ounce)..		10,800

Notice that the price variance is recognized when purchases are made, rather than when materials are actually used in production and that the materials are carried in the inventory account at standard cost. As direct materials are later drawn from inventory and used in production, the quantity variance is isolated as follows:

Work in Process (12,000 ounces at \$0.50 per ounce)	6,000	
Materials Quantity Variance (2,000 ounces U at \$0.50 per ounce).....	1,000	
Raw Materials (14,000 ounces at \$0.50 per ounce).....		7,000

Thus, direct materials are added to the Work in Process account at the standard cost of the materials that should have been used to produce the actual output.

Notice that both the price variance and the quantity variance above are unfavorable and are debit entries. If either of these variances had been favorable, it would have appeared as a credit entry.

Direct Labor Variances

Referring again to the cost data in the review problem at the end of the chapter, the journal entry to record the incurrence of direct labor cost would be:

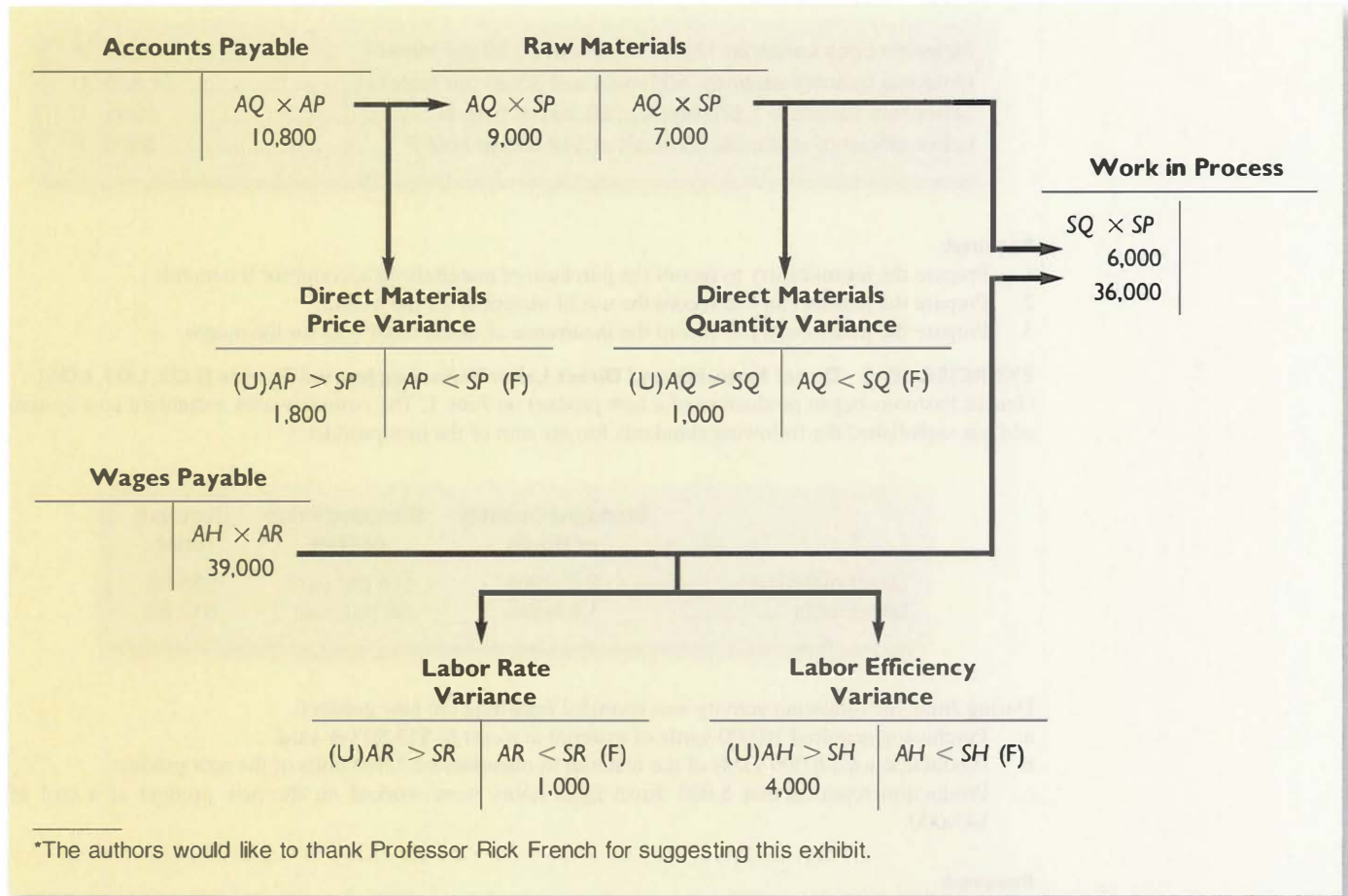
Work in Process (3,600 hours at \$10.00 per hour).....	36,000	
Labor Efficiency Variance (400 hours U at \$10.00 per hour) ...	4,000	
Labor Rate Variance (4,000 hours at \$0.25 per hour F).....		1,000
Wages Payable (4,000 hours at \$9.75 per hour).....		39,000

Thus, as with direct materials, direct labor costs enter into the Work in Process account at standard, both in terms of the rate and in terms of the hours allowed for the actual production of the period. Note that the unfavorable labor efficiency variance is a debit entry whereas the favorable labor rate variance is a credit entry.

Cost Flows in a Standard Cost System

The flow of costs through the company's accounts are illustrated in Exhibit 9B-1. Note that entries into the various inventory accounts are made at standard cost—not actual cost. The differences between actual and standard costs are entered into special accounts that accumulate the various standard cost variances. Ordinarily, these standard cost variance accounts are closed out to Cost of Goods Sold at the end of the period. Unfavorable variances increase Cost of Goods Sold, and favorable variances decrease Cost of Goods Sold.

EXHIBIT 9B-1 Cost Flows in a Standard Cost System*



APPENDIX 9B SUMMARY

LO6 Prepare journal entries to record standard costs and variances.

In a standard costing system, work in process is debited for standard, not actual costs. The differences between standard and actual costs are debited to various variance accounts when unfavorable and credited when favorable.



APPENDIX 9B EXERCISES AND PROBLEMS

BRIEF EXERCISE 9B-1 Recording Variances in the General Ledger [LO6]

Bliny Corporation makes a product with the following standard costs for direct material and direct labor:

Direct material: 2.00 meters at \$3.25 per meter	\$6.50
Direct labor: 0.40 hours at \$12.00 per hour	\$4.80

During the most recent month, 5,000 units were produced. The costs associated with the month's production of this product were as follows:

Material purchased: 12,000 meters at \$3.15 per meter	\$37,800
Material used in production: 10,500 meters	—
Direct labor: 1,975 hours at \$12.20 per hour	\$24,095

The standard cost variances for direct material and direct labor are:

Materials price variance: 12,000 meters at \$0.10 per meter F	\$1,200	F
Materials quantity variance: 500 meters at \$3.25 per meter U	\$1,625	U
Labor rate variance: 1,975 hours at \$0.20 per hour U	\$395	U
Labor efficiency variance: 25 hours at \$12.00 per hour F	\$300	F

Required:

1. Prepare the journal entry to record the purchase of materials on account for the month.
2. Prepare the journal entry to record the use of materials for the month.
3. Prepare the journal entry to record the incurrence of direct labor cost for the month.

EXERCISE 9B-2 Direct Materials and Direct Labor Variances; Journal Entries [LO2, LO3, LO6]

Genola Fashions began production of a new product on June 1. The company uses a standard cost system and has established the following standards for one unit of the new product:

	Standard Quantity or Hours	Standard Price or Rate	Standard Cost
Direct materials	2.5 yards	\$14 per yard	\$35.00
Direct labor	1.6 hours	\$8 per hour	\$12.80

During June, the following activity was recorded regarding the new product:

- a. Purchasing acquired 10,000 yards of material at a cost of \$13.80 per yard.
- b. Production used 8,000 yards of the material to manufacture 3,000 units of the new product.
- c. Production reported that 5,000 direct labor-hours were worked on the new product at a cost of \$43,000.

Required:

1. For direct materials:
 - a. Compute the direct materials price and quantity variances.
 - b. Prepare journal entries to record the purchase of materials and the use of materials in production.
2. For direct labor:
 - a. Compute the direct labor rate and efficiency variances.
 - b. Prepare a journal entry to record the incurrence of direct labor cost for the month.
3. Post the entries you have prepared to the following T-accounts:

Raw Materials	Work in Process								
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: right;">?</td> <td style="width: 50%; text-align: left;">?</td> </tr> <tr> <td style="border-top: 1px dashed black; text-align: right;">Bal.</td> <td style="text-align: left;">?</td> </tr> </table>	?	?	Bal.	?	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: right;">Materials used</td> <td style="width: 50%; text-align: left;">?</td> </tr> <tr> <td style="text-align: right;">Labor cost</td> <td style="text-align: left;">?</td> </tr> </table>	Materials used	?	Labor cost	?
?	?								
Bal.	?								
Materials used	?								
Labor cost	?								
Accounts Payable	Wages Payable								
138,000	43,000								
Materials Price Variance	Materials Quantity Variance								
Labor Rate Variance	Labor Efficiency Variance								

PROBLEM 9B-3A Comprehensive Variance Analysis; Journal Entries [LO2, LO3, LO4, LO6]

Trueform Products, Inc., produces a broad line of sports equipment and uses a standard cost system for control purposes. Last year the company produced 8,000 varsity footballs. The standard costs associated with this football, along with the actual costs incurred last year, are given below (per football):

	Standard Cost	Actual Cost
Direct materials:		
Standard: 3.7 feet at \$5.00 per foot	\$18.50	
Actual: 4.0 feet at \$4.80 per foot		\$19.20
Direct labor:		
Standard: 0.9 hours at \$7.50 per hour	6.75	
Actual: 0.8 hours at \$8.00 per hour		6.40
Variable manufacturing overhead:		
Standard: 0.9 hours at \$2.50 per hour	2.25	
Actual: 0.8 hours at \$2.75 per hour		2.20
Total cost per football	<u>\$27.50</u>	<u>\$27.80</u>

CHECK FIGURE

- (2a) Labor rate variance: \$3,200 U;
- (3) Variable overhead efficiency variance: \$2,000 F



The president was elated when he saw that actual costs exceeded standard costs by only \$0.30 per football. He stated, "I was afraid that our unit cost might get out of hand when we gave out those raises last year in order to stimulate output. But it's obvious our costs are well under control!"

There was no inventory of materials on hand to start the year. During the year, 32,000 feet of materials were purchased and used in production.

Required:

1. For direct materials:
 - a. Compute the price and quantity variances for the year.
 - b. Prepare journal entries to record all activity relating to direct materials for the year.
2. For direct labor:
 - a. Compute the rate and efficiency variances.
 - b. Prepare a journal entry to record the incurrence of direct labor cost for the year.
3. Compute the variable overhead rate and efficiency variances.
4. Was the president correct in his statement that "our costs are well under control"? Explain.
5. State possible causes of each variance that you have computed.

PROBLEM 9B-4A Comprehensive Variance Analysis with Incomplete Data; Journal Entries [LO2, LO3, LO4, LO6]

Maple Products, Ltd., manufactures a super-strong hockey stick. The standard cost of one hockey stick is:

	Standard Quantity or Hours	Standard Price or Rate	Standard Cost
Direct materials	? feet	\$3.00 per foot	\$?
Direct labor	2 hours	? per hour	?
Variable manufacturing overhead	? hours	\$1.30 per hour	?
Total standard cost			<u>\$27.00</u>

CHECK FIGURE

- (1a) Materials price variance: \$6,000 F;
- (3) Variable overhead rate variance: \$1,650 F



excel

Last year, 8,000 hockey sticks were produced and sold. Selected cost data relating to last year's operations follow:

	Dr.	Cr.
Accounts payable—direct materials purchased (60,000 feet)		\$174,000
Wages payable (? hours)		\$79,200*
Work in process—direct materials	\$115,200	
Direct labor rate variance		\$3,300
Variable overhead efficiency variance	\$650	

*Relates to the actual direct labor cost for the year.

The following additional information is available for last year's operations:

- a. No materials were on hand at the start of last year. Some of the materials purchased during the year were still on hand in the warehouse at the end of the year.
- b. The variable manufacturing overhead rate is based on direct labor-hours. Total actual variable manufacturing overhead cost for last year was \$19,800.
- c. Actual direct materials usage for last year exceeded the standard by 0.2 feet per stick.

Required:

1. For direct materials:
 - a. Compute the price and quantity variances for last year.
 - b. Prepare journal entries to record all activities relating to direct materials for last year.
2. For direct labor:
 - a. Using the rate variance given on the prior page, calculate the standard hourly wage rate and compute the efficiency variance for last year.
 - b. Prepare a journal entry to record activity relating to direct labor for last year.
3. Compute the variable overhead rate variance for last year and verify the variable overhead efficiency variance given on the prior page.
4. State possible causes of each variance that you have computed.
5. Prepare a standard cost card for one hockey stick.

10

Segment Reporting, Decentralization, and the Balanced Scorecard

<< A LOOK BACK

In Chapter 9, we looked in greater detail at the spending variances introduced in Chapter 8. Standards were used to isolate the effects of various factors on actual results. In particular, we computed material, labor, and overhead variances.

A LOOK AT THIS CHAPTER

In Chapter 10, we continue our coverage of performance measurement. Return on investment and residual income measures are used to motivate managers and monitor progress. The balanced scorecard is an integrated set of performance measures that are derived from and support the organization's strategy.

A LOOK AHEAD >>

In Chapter 11, we concentrate on the identification of relevant costs and benefits to aid decision making.

CHAPTER OUTLINE

Decentralization in Organizations

- Advantages and Disadvantages of Decentralization

Responsibility Accounting

- Cost, Profit, and Investment Centers
- An Organizational View of Responsibility Centers

Decentralization and Segment Reporting

- Building a Segmented Income Statement
- Levels of Segmented Statements
- Sales and Contribution Margin
- Traceable and Common Fixed Costs
- Traceable Costs Can Become Common Costs
- Segment Margin
- Segmented Financial Information in External Reports

Hindrances to Proper Cost Assignment

- Omission of Costs
- Inappropriate Methods for Assigning Traceable Costs among Segments
- Arbitrarily Dividing Common Costs among Segments

Evaluating Investment Center Performance—Return on Investment

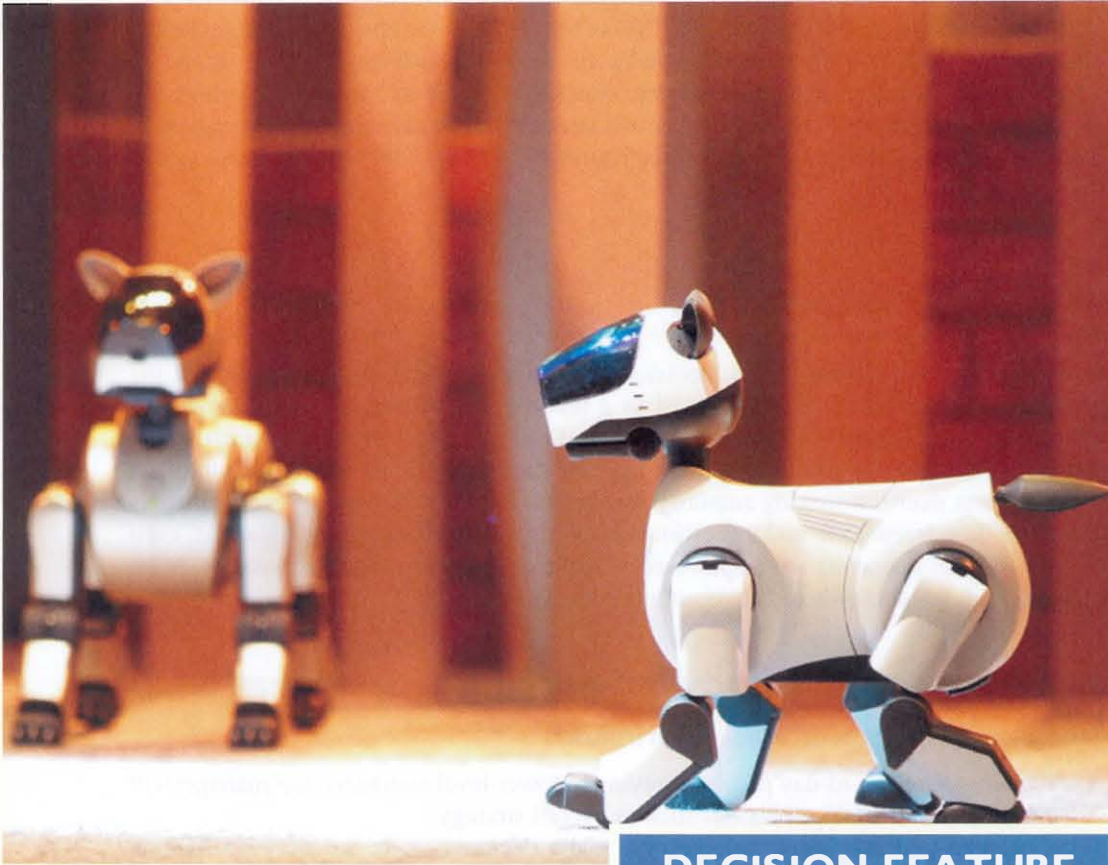
- The Return on Investment (ROI) Formula
- Net Operating Income and Operating Assets Defined
- Understanding ROI
- Criticisms of ROI

Residual Income

- Motivation and Residual Income
- Divisional Comparison and Residual Income

Balanced Scorecard

- Common Characteristics of Balanced Scorecards
- A Company's Strategy and the Balanced Scorecard
- Tying Compensation to the Balanced Scorecard
- Advantages of Timely and Graphic Feedback



DECISION FEATURE

Sony Attempts to Rebound

Last century **Sony** delighted customers with its Walkman, the Trinitron TV, the PlayStation, and the CD. However, in the digital media era Sony has lost ground to many better-managed competitors such as Microsoft, Apple, Sharp, and Nokia. Sony is attempting to rebound by discontinuing unprofitable segments such as Aibo, a line of robotic pets; Qualia, a line of boutique electronics; 1,220 cosmetic salons; and 18 Maxim de Paris restaurants. In addition, the company has closed nine plants, sold \$705 million worth of assets, and eliminated 5,700 jobs.

The next step for Sony is to improve communications across its remaining business units. For example, at one point Sony had three business units unknowingly competing against one another by developing their own digital music players. Sony's challenge is to encourage decentralized decision making to spur product innovation, while centralizing control of communications across the company so that engineers do not create competing or incompatible products.

Source: Marc Gunther, "The Welshman, the Walkman, and the Salarymen," *Fortune*, June 12, 2006, pp. 70–83.

LEARNING OBJECTIVES



After studying Chapter 10, you should be able to:

- LO1** Prepare a segmented income statement using the contribution format, and explain the difference between traceable fixed costs and common fixed costs.
- LO2** Compute return on investment (ROI) and show how changes in sales, expenses, and assets affect ROI.
- LO3** Compute residual income and understand its strengths and weaknesses.
- LO4** Understand how to construct and use a balanced scorecard.



Except in very small organizations, top managers must delegate some decisions. For example, the CEO of the **Hyatt Hotel** chain cannot be expected to decide whether a particular hotel guest at the Hyatt Hotel on Maui should be allowed to check out later than the normal checkout time. It makes sense for the CEO to authorize employees at Maui to make this decision. As in this example, managers in large organizations have to delegate some decisions to those who are at lower levels in the organization.

DECENTRALIZATION IN ORGANIZATIONS

In a **decentralized organization**, decision-making authority is spread throughout the organization rather than being confined to a few top executives. As noted above, out of necessity all large organizations are decentralized to some extent. Organizations do differ, however, in the extent to which they are decentralized. In strongly centralized organizations, decision-making authority is reluctantly delegated to lower-level managers who have little freedom to make decisions. In strongly decentralized organizations, even the lowest-level managers are empowered to make as many decisions as possible. Most organizations fall somewhere between these two extremes.

Advantages and Disadvantages of Decentralization

The major advantages of decentralization include:

1. By delegating day-to-day problem solving to lower-level managers, top management can concentrate on bigger issues such as overall strategy.
2. Empowering lower-level managers to make decisions puts the decision-making authority in the hands of those who tend to have the most detailed and up-to-date information about day-to-day operations.
3. By eliminating layers of decision making and approvals, organizations can respond more quickly to customers and to changes in the operating environment.
4. Granting decision-making authority helps train lower-level managers for higher-level positions.
5. Empowering lower-level managers to make decisions can increase their motivation and job satisfaction.

The major disadvantages of decentralization include:

1. Lower-level managers may make decisions without fully understanding the big picture.
2. If lower-level managers make their own decisions, coordination may be lacking.
3. Lower-level managers may have objectives that clash with the objectives of the entire organization.¹ For example, a manager may be more interested in increasing the size

¹Similar problems exist with top-level managers as well. The shareholders of the company delegate their decision-making authority to the top managers. Unfortunately, top managers may abuse that trust by rewarding themselves and their friends too generously, spending too much company money on palatial offices, and so on. The issue of how to ensure that top managers act in the best interests of the company's owners continues to challenge experts. To a large extent, the owners rely on performance evaluation using return on investment and residual income measures as discussed later in the chapter and on bonuses and stock options. The stock market is also an important disciplining mechanism. If top managers squander the company's resources, the price of the company's stock will almost surely fall—resulting in a loss of prestige, bonuses, and possibly a job. And, of course, particularly outrageous self-dealing may land a CEO in court, as recent events have demonstrated.

- of his or her department, leading to more power and prestige, than in increasing the department's effectiveness.
4. Spreading innovative ideas may be difficult in a decentralized organization. Someone in one part of the organization may have a terrific idea that would benefit other parts of the organization, but without strong central direction the idea may not be shared with, and adopted by, other parts of the organization.

Decentralization: A Delicate Balance

IN BUSINESS

Decentralization has its advantages and disadvantages. **Bed Bath & Beyond**, a specialty retailer, benefits from allowing its local store managers to choose 70% of their store's merchandise based on local customer tastes. For example, the company's Manhattan stores stock wall paint, but its suburban stores do not because home improvement giants in the suburbs, such as **Home Depot**, meet this customer need.

On the other hand, **Nestle**, the Swiss consumer food products company, has been working to overcome glaring inefficiencies resulting from its decentralized management structure. For example, in Switzerland "each candy and ice cream factory was ordering its own sugar. Moreover, different factories were using different names for the identical grade of sugar, making it almost impossible for bosses at headquarters to track costs." Nestle hopes to significantly reduce costs and simplify recordkeeping by centralizing its raw materials purchases.

Sources: Nanette Byrnes, "What's Beyond for Bed Bath & Beyond?" *BusinessWeek*, January 19, 2004, pp. 44–50; and Carol Matlack, "Nestle Is Starting to Slim Down at Last," *BusinessWeek*, October 27, 2003, pp. 56–57.

RESPONSIBILITY ACCOUNTING

Decentralized organizations need *responsibility accounting systems* that link lower-level managers' decision-making authority with accountability for the outcomes of those decisions. The term **responsibility center** is used for any part of an organization whose manager has control over and is accountable for cost, profit, or investments. The three primary types of responsibility centers are *cost centers*, *profit centers*, and *investment centers*.²

Cost, Profit, and Investment Centers

Cost Center The manager of a **cost center** has control over costs, but not over revenue or the use of investment funds. Service departments such as accounting, finance, general administration, legal, and personnel are usually classified as cost centers. In addition, manufacturing facilities are often considered to be cost centers. The managers of cost centers are expected to minimize costs while providing the level of products and services demanded by other parts of the organization. For example, the manager of a manufacturing facility would be evaluated at least in part by comparing actual costs to how much costs should have been for the actual level of output during the period.

²Some companies classify business segments that are responsible mainly for generating revenue, such as an insurance sales office, as *revenue centers*. Other companies would consider this to be just another type of profit center because costs of some kind (salaries, rent, utilities) are usually deducted from the revenues in the segment's income statement.

Standard cost variances and flexible budget variances, such as those discussed in earlier chapters, are often used to evaluate cost center performance.



Profit Center The manager of a **profit center** has control over both costs and revenue, but not over the use of investment funds. For example, the manager in charge of a **Six Flags** amusement park would be responsible for both the revenues and costs, and hence the profits, of the amusement park, but may not have control over major investments in the park. Profit center managers are often evaluated by comparing actual profit to targeted or budgeted profit.

IN BUSINESS

Responsibility Accounting: A Chinese Perspective

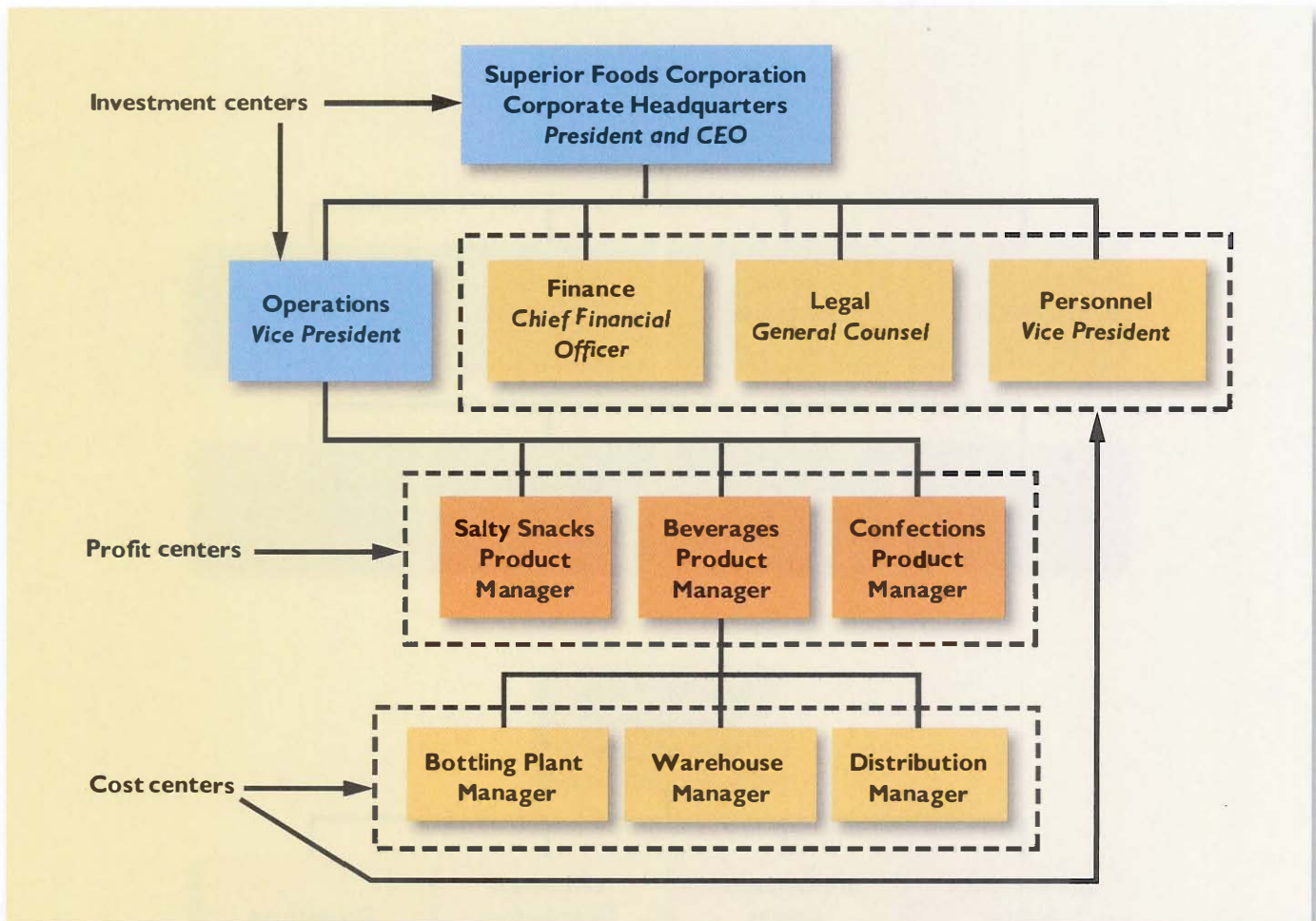
For years **Han Dan Iron and Steel Company** was under Chinese government control. During this period, the company's management accounting system focused on complying with government mandates rather than responding to the market. As a market-oriented economy began to emerge, the company realized that its management accounting system was obsolete. Managers were preoccupied with meeting production quotas imposed by the government rather than controlling costs and meeting profit targets or encouraging productivity improvements. To remedy this situation, the company implemented what it called a *responsibility cost control* system that (1) set cost and profit targets, (2) assigned target costs to responsibility center managers, (3) evaluated the performance of responsibility center managers based on their ability to meet the targets, and (4) provided incentives to improve productivity.

Source: Z. Jun Lin and Zengbiao Yu, "Responsibility Cost Control System in China: A Case of Management Accounting Application," *Management Accounting Research*, December 2002, pp. 447–467.

Investment Center The manager of an **investment center** has control over cost, revenue, and investments in operating assets. For example, **General Motors'** vice president of manufacturing in North America would have a great deal of discretion over investments in manufacturing—such as investing in equipment to produce more fuel-efficient engines. Once General Motors' top-level managers and board of directors approve the vice president's investment proposals, he is held responsible for making them pay off. Investment center managers are often evaluated using return on investment (ROI) or residual income measures, as discussed later in the chapter.

An Organizational View of Responsibility Centers

Superior Foods Corporation, a company that manufactures and distributes snack foods and beverages, provides an example of the various kinds of responsibility centers. Exhibit 10–1 shows a partial organization chart for Superior Foods that displays its cost, profit, and investment centers. The departments and work centers that do not generate significant revenues by themselves are classified as cost centers. These are staff departments—such as finance, legal, and personnel—and operating units—such as the bottling plant, warehouse, and beverage distribution center. The profit centers generate revenues, and they include the salty snacks, beverages, and confections product families. The vice president of operations oversees the allocation of investment funds across the product families and is responsible for the profits of those product families. And finally, corporate headquarters is an investment center because it is responsible for all revenues, costs, and investments.

EXHIBIT 10-1 Examples of Cost, Profit, and Investment Centers

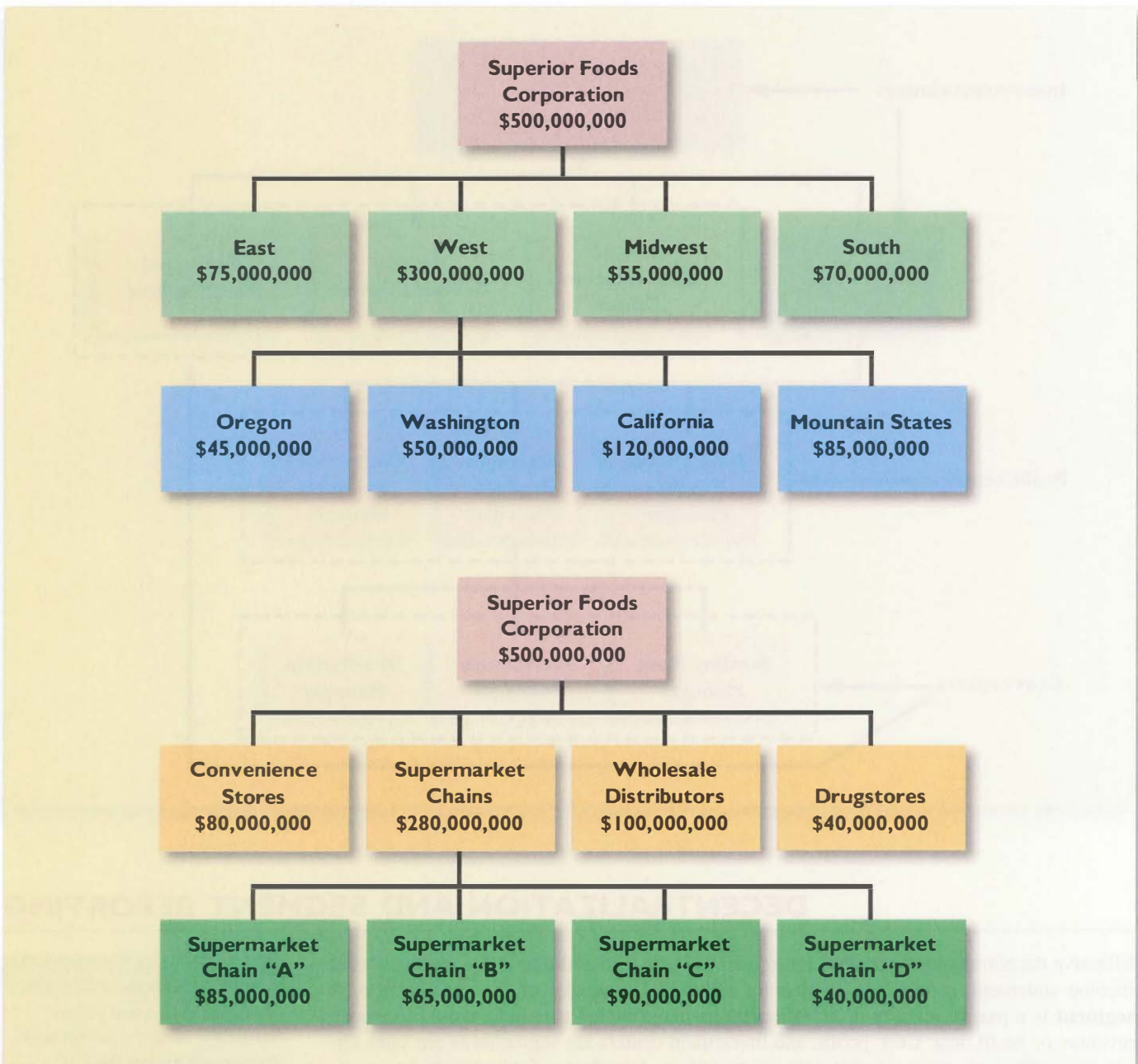
DECENTRALIZATION AND SEGMENT REPORTING

Effective decentralization requires *segmented reporting*. In addition to the companywide income statement, reports are needed for individual segments of the organization. A **segment** is a part or activity of an organization about which managers would like cost, revenue, or profit data. Cost, profit, and investment centers are segments as are sales territories, individual stores, service centers, manufacturing plants, marketing departments, individual customers, and product lines. A company's operations can be segmented in many ways. For example, Exhibit 10-2 shows several ways in which Superior Foods could segment its business. The top half of the exhibit shows Superior segmenting its \$500 million in revenue by geographical region, and the bottom half shows Superior segmenting its total revenue by customer channel. With the appropriate database and software, managers could easily drill even further down into the organization. For example, the sales in California could be segmented by product family, then by product line. This drill-down capability helps managers to identify the sources of strong or weak overall financial performance. In this chapter, we learn how to construct income statements for business segments. These segmented income statements are useful in analyzing the profitability of segments and in measuring the performance of segment managers.

LEARNING OBJECTIVE 1

Prepare a segmented income statement using the contribution format, and explain the difference between traceable fixed costs and common fixed costs.

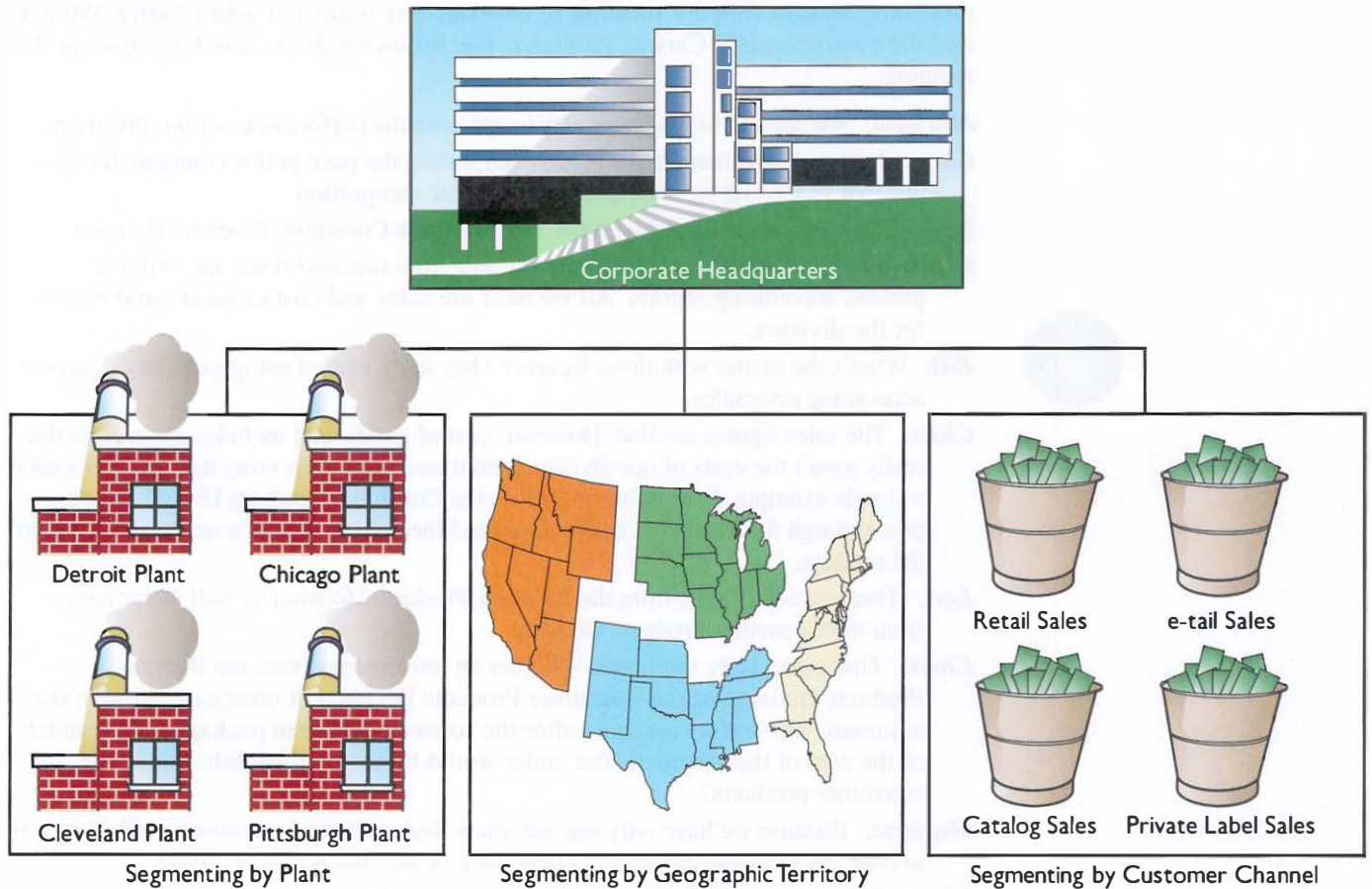


EXHIBIT 10-2 Superior Foods Corporation: Revenue Segmented by Geographic Region and Customer Channel**IN BUSINESS****Cross-Border Segments Wreak Havoc for Airbus**

The **Airbus** A380 double-decker jet has experienced massive construction delays. The company segments the 55,000 employees involved in its plane-building process across four plants in four countries. The plant in Germany does some assembly and cabin outfitting. The plant in Britain handles wing design and manufacturing and the plant in Spain handles tail manufacturing. The plant in France completes final assembly. Unfortunately, involving four countries in the manufacturing process also means involving four governments and four sets of politicians. The inevitable meddling, lobbying, and bureaucracy that influenced the manufacturing process helps explain why Airbus expects to realize a \$6 billion reduction in profits over four years.

Source: Carol Matlack, "Wayward Airbus," *BusinessWeek*, October 23, 2006, pp. 46-48.

Segmenting a Company



Building a Segmented Income Statement

Several important principles are involved in constructing a useful segmented income statement. These principles are illustrated in the following example.

ProphetMax, Inc., is a rapidly growing computer software company founded by Lori Saffer, who had previously worked in a large software company, and Marjorie Matsuo, who had previously worked in the hotel industry as a general manager. They formed the company to develop and market user-friendly accounting and operations software designed specifically for hotels. They quit their jobs, pooled their savings, hired several programmers, and got down to work.

The first sale was by far the most difficult. No hotel wanted to be the first to use an untested product from an unknown company. After overcoming this obstacle with persistence, good luck, dedication to customer service, and a very low introductory price, the company's sales grew.

The company quickly developed similar business software for other specialized markets and then branched out into clip art and computer games. Within four years of its founding, the organization had grown to the point where Saffer and Matsuo were no longer able to personally direct all of the company's activities. Decentralization had become a necessity.

Accordingly, the company was split into two divisions—Business Products and Consumer Products. By mutual consent, Matsuo took the title president and Saffer took the title vice president of the Business Products Division. Chris Worden, a programmer who had spearheaded the drive into the clip art and computer games markets, was designated vice president of the Consumer Products Division.

MANAGERIAL ACCOUNTING IN ACTION
The Issue



Almost immediately, the issue arose of how best to evaluate the performance of the divisions. Matsuo called a meeting to consider this issue and asked Saffer, Worden, and the controller, Bill Carson, to attend. The following discussion took place at that meeting:

Marjorie: We need to find a better way to measure the performance of our divisions.

Chris: I agree. Consumer Products has been setting the pace in this company for the last two years, and we should be getting more recognition.

Lori: Chris, we are delighted with the success of the Consumer Products Division.

Chris: I know. But it is hard to figure out just how successful we are with the present accounting reports. All we have are sales and cost of goods sold figures for the division.

Bill: What's the matter with those figures? They are prepared using generally accepted accounting principles.

Chris: The sales figures are fine. However, cost of goods sold includes some costs that really aren't the costs of our division, and it excludes some costs that are. Let's take a simple example. Everything we sell in the Consumer Products Division has to pass through the automatic bar-coding machine, which applies a unique bar code to the product.

Lori: That's true for items from the Business Products Division as well as for items from the Consumer Products Division.

Chris: That's precisely the point. Whether an item comes from the Business Products Division or the Consumer Products Division, it must pass through the automatic bar-coding machine after the software has been packaged. How much of the cost of the automatic bar coder would be saved if we didn't have any consumer products?

Marjorie: Because we have only one automatic bar coder and we would need it anyway to code the business products, I guess none of the cost would be saved.

Chris: That's right. And because none of the cost could be saved even if the entire Consumer Products Division were eliminated, how can we logically say that some of the cost of the automatic bar coder is a cost of the Consumer Products Division?

Lori: Just a minute, Chris, are you saying that my Business Products Division should be charged with the entire cost of the automatic bar coder?

Chris: No, that's not what I am saying.

Marjorie: But Chris, I don't see how we can have sensible performance reports without making someone responsible for costs like the cost of the automatic bar coder. Bill, as our accounting expert, what do you think?

Bill: I have some ideas for handling issues like the automatic bar coder. The best approach would probably be for me to put together a draft performance report. We can discuss it at the next meeting when everyone has something concrete to look at.

Marjorie: Okay, let's see what you come up with.

Bill Carson, the controller of ProphetMax, realized that segmented income statements would be required to more appropriately evaluate the performance of the two divisions. To construct the segmented reports, he would have to carefully segregate costs that are attributable to the segments from costs that are not. Because most of the disputes over costs would be about fixed costs such as the automatic bar-coding machine, he knew he would also have to separate fixed from variable costs. The conventional absorption costing income statement prepared for the entire company commingles variable and fixed manufacturing costs in the cost of goods sold.

Largely for these reasons, Bill Carson decided to use the contribution format income statement based on variable costing that was discussed in earlier chapters. Recall that when the contribution format is used: (1) the cost of goods sold consists only of the variable manufacturing costs; (2) variable and fixed costs are listed in separate sections; and (3) a contribution margin is computed. When such a statement is segmented as in this chapter, fixed costs are broken down further into what are called traceable and common costs as discussed later. This breakdown allows a *segment margin* to be computed for each segment of the company. The segment margin is a valuable tool for assessing the long-run profitability of a segment and is also a much better tool for evaluating performance than absorption costing income statements.

Levels of Segmented Statements

A portion of the segmented report Bill Carson prepared is shown in Exhibit 10–3. The contribution format income statement for the entire company appears at the very top of the exhibit under the column labeled Total Company. Immediately to the right of this column are two columns—one for each of the two divisions. We can see that the Business Products Division's segment margin is \$60,000 and the Consumer Products Division's is \$40,000. These segment margins show the company's divisional managers how much each of their divisions is contributing to the company's profits.

However, segmented income statements can be prepared for activities at many levels in a company. To provide more information to the company's divisional managers, Bill Carson has further segmented the divisions according to their major product lines. In the case of the Consumer Products Division, the product lines are clip art and computer games. Going even further, Bill Carson has segmented each of the product lines according to how they are sold—in retail computer stores or over the Internet. In Exhibit 10–3, this further segmentation is illustrated for the computer games product line. Notice that as we go from one segmented statement to another, we look at smaller and smaller pieces of the company. While not shown in Exhibit 10–3, Bill Carson also prepared segmented income statements for the major product lines in the Business Products Division.

Computing Segment Margins Helps an Entrepreneur

IN BUSINESS

In 2001, **Victoria Pappas Collection**, a small company specializing in women's sportswear, reported a net loss of \$280,000 on sales of \$1 million. When the company's founder, Vickie Giannukos, segmented her company's income statement into the six markets that she was serving, the results were revealing. The Dallas and Atlanta markets generated \$825,000 of sales and incurred \$90,000 of traceable fixed costs. The other four markets combined produced \$175,000 of sales and also incurred \$90,000 of traceable fixed costs. Given the average contribution margin ratio of 38%, the Dallas and Atlanta markets earned a segment margin of \$223,500 [$(\$825,000 \times 38\%) - \$90,000$] while the other four markets combined incurred a loss of \$23,500 [$(\$175,000 \times 38\%) - \$90,000$].

Vicky had made a common mistake—she chased every possible dollar of sales without knowing if her efforts were profitable. Based on her segmented income statements, she discontinued operations in three cities and hired a new sales representative in Los Angeles. She decided to focus on growing sales in Dallas and Atlanta while deferring expansion into new markets until it could be done profitably.

Source: Norm Brodsky, "The Thin Red Line," *Inc.* magazine, January 2004, pp. 49–52.

EXHIBIT 10-3

ProphetMax, Inc.—Segmented
Income Statements in the
Contribution Format

Segments Defined as Divisions

	Total Company	Divisions	
		Business Products Division	Consumer Products Division
Sales	\$500,000	\$300,000	\$200,000
Variable expenses:			
Variable cost of goods sold	180,000	120,000	60,000
Other variable expenses	50,000	30,000	20,000
Total variable expenses	230,000	150,000	80,000
Contribution margin	270,000	150,000	120,000
Traceable fixed expenses	170,000	90,000	80,000*
Divisional segment margin	100,000	<u>\$ 60,000</u>	<u>\$ 40,000</u>
Common fixed expenses not traceable to individual divisions	85,000		
Net operating income	<u>\$ 15,000</u>		

**Segments Defined as Product Lines
of the Consumer Products Division**

	Consumer Products Division	Product Line	
		Clip Art	Computer Games
Sales	\$200,000	\$ 75,000	\$125,000
Variable expenses:			
Variable cost of goods sold	60,000	20,000	40,000
Other variable expenses	20,000	5,000	15,000
Total variable expenses	80,000	25,000	55,000
Contribution margin	120,000	50,000	70,000
Traceable fixed expenses	70,000	30,000	40,000
Product-line segment margin	50,000	<u>\$ 20,000</u>	<u>\$ 30,000</u>
Common fixed expenses not traceable to individual product lines	10,000		
Divisional segment margin	<u>\$ 40,000</u>		

**Segments Defined as Sales Channels for One Product Line,
Computer Games, of the Consumer Products Division**

	Computer Games	Sales Channels	
		On-Line Sales	Retail Stores
Sales	\$125,000	\$100,000	\$ 25,000
Variable expenses:			
Variable cost of goods sold	40,000	32,000	8,000
Other variable expenses	15,000	5,000	10,000
Total variable expenses	55,000	37,000	18,000
Contribution margin	70,000	63,000	7,000
Traceable fixed expenses	25,000	15,000	10,000
Sales-channel segment margin	45,000	<u>\$ 48,000</u>	<u>\$ (3,000)</u>
Common fixed expenses not traceable to individual sales channels	15,000		
Product-line segment margin	<u>\$ 30,000</u>		

*Notice that this \$80,000 in traceable fixed expenses is divided into two parts when the Consumer Products Division is broken down into product lines—\$70,000 traceable and \$10,000 common. The reasons for this are discussed later in the section “Traceable Costs Can Become Common Costs.”

Sales and Contribution Margin

To prepare a segmented income statement, variable expenses are deducted from sales to yield the contribution margin for the segment. The contribution margin tells us what happens to profits as volume changes—holding a segment's capacity and fixed costs constant. The contribution margin is especially useful in decisions involving temporary uses of capacity such as special orders. These types of decisions often involve only variable costs and revenues—the two components of contribution margin. Such decisions will be discussed in detail in the next chapter.

Traceable and Common Fixed Costs

The most puzzling aspect of Exhibit 10–3 is probably the treatment of fixed costs. The report lists two kinds of fixed costs—traceable and common. Only the *traceable fixed costs* are charged to particular segments. If a cost is not traceable to a segment, then it is not assigned to the segment.

A **traceable fixed cost** of a segment is a fixed cost that is incurred because of the existence of the segment—if the segment had never existed, the fixed cost would not have been incurred; and if the segment were eliminated, the fixed cost would disappear. Examples of traceable fixed costs include the following:

- The salary of the Fritos product manager at **PepsiCo** is a *traceable* fixed cost of the Fritos business segment of PepsiCo.
- The maintenance cost for the building in which Boeing 747s are assembled is a *traceable* fixed cost of the 747 business segment of **Boeing**.
- The liability insurance at **Disney World** is a *traceable* fixed cost of the Disney World business segment of the **Disney Corporation**.



A **common fixed cost** is a fixed cost that supports the operations of more than one segment, but is not traceable in whole or in part to any one segment. Even if a segment were entirely eliminated, there would be no change in a true common fixed cost. For example:

- The salary of the CEO of **General Motors** is a *common* fixed cost of the various divisions of General Motors.
- The cost of heating a **Safeway** or **Kroger** grocery store is a *common* fixed cost of the store's various departments—groceries, produce, bakery, meat, etc.
- The cost of the automatic bar-coding machine at ProphetMax is a *common* fixed cost of the Consumer Products Division and of the Business Products Division.
- The cost of the receptionist's salary at an office shared by a number of doctors is a *common* fixed cost of the doctors. The cost is traceable to the office, but not to individual doctors.

Identifying Traceable Fixed Costs The distinction between traceable and common fixed costs is crucial in segment reporting because traceable fixed costs are charged to segments and common fixed costs are not. In an actual situation, it is sometimes hard to determine whether a cost should be classified as traceable or common.

The general guideline is to treat as traceable costs *only those costs that would disappear over time if the segment itself disappeared*. For example, if the Consumer Products Division were sold or discontinued, it would no longer be necessary to pay the division manager's salary. Therefore the division manager's salary should be classified as a traceable fixed cost of the division. On the other hand, the president of the company undoubtedly would continue to be paid even if the Consumer Products Division were dropped. In fact, he or she might even be paid more if dropping the division was a good idea. Therefore, the president's salary is common to both divisions and should not be charged to either division.

When assigning costs to segments, the key point is to resist the temptation to allocate costs (such as depreciation of corporate facilities) that are clearly common and that will

continue regardless of whether the segment exists or not. *Any allocation of common costs to segments reduces the value of the segment margin as a measure of long-run segment profitability and segment performance.*

Activity-Based Costing Some costs are easy to identify as traceable costs. For example, the cost of advertising Crest toothpaste on television is clearly traceable to **Crest**. A more difficult situation arises when a building, machine, or other resource is shared by two or more segments. For example, assume that a multiproduct company leases warehouse space that is used for storing the full range of its products. Would the lease cost of the warehouse be a traceable or a common cost of the products? Managers familiar with activity-based costing might argue that the lease cost is traceable and should be assigned to the products according to how much space the products use in the warehouse. In like manner, these managers would argue that order processing costs, sales support costs, and other selling and administrative expenses should also be charged to segments according to the segments' consumption of selling and administrative resources.

To illustrate, consider Holt Corporation, a company that manufactures concrete pipe for industrial uses. The company has three products—9-inch pipe, 12-inch pipe, and 18-inch pipe. Space is rented in a large warehouse on a yearly basis as needed. The rental cost of this space is \$4 per square foot per year. The 9-inch pipe occupies 1,000 square feet of space, the 12-inch pipe occupies 4,000 square feet, and the 18-inch pipe occupies 5,000 square feet. The company also has an order processing department that incurred \$150,000 in order processing costs last year. Management believes that order processing costs are driven by the number of orders placed by customers. Last year 2,500 orders were placed, of which 1,200 were for 9-inch pipe, 800 were for 12-inch pipe, and 500 were for 18-inch pipe. Given these data, the following costs would be assigned to each product using the activity-based costing approach:

Warehouse space cost:	
9-inch pipe: \$4 per square foot × 1,000 square feet.....	\$ 4,000
12-inch pipe: \$4 per square foot × 4,000 square feet.....	16,000
18-inch pipe: \$4 per square foot × 5,000 square feet.....	20,000
Total cost assigned.....	<u>\$ 40,000</u>
Order processing costs:	
\$150,000 ÷ 2,500 orders = \$60 per order	
9-inch pipe: \$60 per order × 1,200 orders.....	\$ 72,000
12-inch pipe: \$60 per order × 800 orders.....	48,000
18-inch pipe: \$60 per order × 500 orders.....	30,000
Total cost assigned.....	<u>\$150,000</u>

This method of assigning costs combines the strength of activity-based costing with the power of the contribution approach and greatly enhances the manager's ability to measure the profitability and performance of segments. However, managers must still ask themselves if the costs would in fact disappear over time if the segment itself disappeared. In the case of Holt Corporation, it is clear that the \$20,000 in warehousing costs for the 18-inch pipe would be eliminated if 18-inch pipes were no longer being produced. The company would simply rent less warehouse space the following year. However, suppose the company owns the warehouse. Then it is not so clear that \$20,000 of warehousing cost would really disappear if the 18-inch pipes were discontinued. The company might be able to sublease the space, or use it for other products, but then again the space might simply be empty while the warehousing costs continue to be incurred.

EXHIBIT 10-4
Reclassification of Traceable Fixed Expenses from Exhibit 10-3

	Total Company	Segment	
		Business Products Division	Consumer Products Division
Contribution margin	\$270,000	\$150,000	\$120,000
Traceable fixed expenses	170,000	90,000	80,000

	Consumer Products Division	Segment	
		Clip Art	Computer Games
Contribution margin	\$120,000	\$50,000	\$70,000
Traceable fixed expenses	70,000	30,000	40,000
Product-line segment margin	50,000	\$20,000	\$30,000
Common fixed expenses	10,000		
Divisional segment margin	\$ 40,000		

Traceable Costs Can Become Common Costs

Fixed costs that are traceable to one segment may be a common cost of another segment. For example, **United Airlines** might want a segmented income statement that shows the segment margin for a particular flight from Chicago to Paris further broken down into first-class, business-class, and economy-class segment margins. The airline must pay a substantial landing fee at Charles DeGaulle airport in Paris. This fixed landing fee is a traceable cost of the flight, but it is a common cost of the first-class, business-class, and economy-class segments. Even if the first-class cabin is empty, the entire landing fee must be paid. So the landing fee is not a traceable cost of the first-class cabin. But on the other hand, paying the fee is necessary in order to have any first-class, business-class, or economy-class passengers. So the landing fee is a common cost of these three classes.

The dual nature of some fixed costs can be seen in Exhibit 10-4. Notice from the diagram that when segments are defined as divisions, the Consumer Products Division has \$80,000 in traceable fixed expenses. However, when we drill down to the product lines, only \$70,000 of the \$80,000 cost that was traceable to the Consumer Products Division is traceable to the product lines. The other \$10,000 becomes a common cost of the two product lines of the Consumer Products Division.

Why would \$10,000 of traceable fixed cost become a common cost when the division is divided into product lines? The \$10,000 is the monthly salary of the manager of the Consumer Products Division. This salary is a traceable cost of the division as a whole, but it is a common cost of the division's product lines. The manager's salary is a necessary cost of having the two product lines, but even if one of the product lines were discontinued entirely, the manager's salary would probably not be cut. Therefore, none of the manager's salary can really be traced to the individual products.

The \$70,000 traceable fixed cost of the product lines consists of the costs of product specific advertising. A total of \$30,000 was spent on advertising clip art and \$40,000 was spent on advertising computer games. These costs can clearly be traced to the individual product lines.

Segment Margin

Observe from Exhibit 10-3 (see page 462) that the **segment margin** is obtained by deducting the traceable fixed costs of a segment from the segment's contribution margin. It represents the margin available after a segment has covered all of its own costs.

The segment margin is the best gauge of the long-run profitability of a segment because it includes only those costs that are caused by the segment. If a segment can't cover its own costs, then that segment probably should be dropped (unless it has important side effects on other segments). Notice from Exhibit 10–3, for example, that the Retail Stores sales channel has a negative segment margin. This means that the segment is not generating enough revenue to cover its own costs. Retention or elimination of product lines and other segments is covered in more depth in the next chapter.

From a decision-making point of view, the segment margin is most useful in major decisions that affect capacity such as dropping a segment. By contrast, as we noted earlier, the contribution margin is most useful in decisions involving short-run changes in volume, such as pricing special orders that involve temporary use of existing capacity.

IN BUSINESS

Has the Internet Killed Catalogs?

Smith & Hawken, an outdoor-accessories retailer, has experienced growing Internet sales and declining catalog sales. These trends seem consistent with conventional wisdom, which suggests that the Internet will make catalogs obsolete. Yet, Smith & Hawken, like many retailers with growing Internet sales, has no plans to discontinue its catalogs. In fact, the total number of catalogs mailed in the United States by all companies jumped from 16.6 billion in 2002 to 19.2 billion in 2005. Why?

Catalog shoppers and Internet shoppers are not independent customer segments. Catalog shoppers frequently choose to complete their sales transactions online rather than placing telephone orders. This explains why catalogs remain a compelling marketing medium even though catalog sales are declining for many companies. If retailers separately analyze catalog sales and Internet sales, they may discontinue the catalogs segment while overlooking the adverse impact of this decision on Internet segment margins.

Source: Louise Lee, "Catalogs, Catalogs, Everywhere," *BusinessWeek*, December 4, 2006, pp. 32–34.

MANAGERIAL ACCOUNTING IN ACTION

The Wrap-up



Shortly after Bill Carson, the ProphetMax, Inc., controller, completed the segmented income statement, he sent copies to the other managers and called a meeting in which the report could be explained—Marjorie Matsuo, Lori Saffer, and Chris Worden were all in attendance.

Lori: I think these segmented income statements are fairly self-explanatory. However, there is one thing I wonder about.

Bill: What's that?

Lori: What is this common fixed expense of \$85,000 listed under the total company? And who is going to be responsible for it if neither Chris nor I have responsibility?

Bill: The \$85,000 of common fixed expenses represents expenses like administrative salaries and the costs of common production equipment such as the automatic bar-coding machine. Marjorie, do you want to respond to the question about responsibility for these expenses?

Marjorie: Sure. Because I'm the president of the company, I'm responsible for those costs. Some things can be delegated, others cannot be. It wouldn't make any sense for either you or Chris to make strategic decisions about the bar coder because it affects both of you. That's an important part of my job—making decisions about resources that affect all parts of the organization. This report makes it much clearer who is responsible for what. I like it.

Chris: So do I—my division's segment margin is higher than the net operating income for the entire company.

Marjorie: Don't get carried away, Chris. Let's not misinterpret what this report means. The segment margins *have* to be big to cover the common costs of the company. We can't let the big segment margins lull us into a sense of complacency. If we use these reports, we all have to agree that our objective is to increase all of our segment margins over time.

Lori: I'm willing to give it a try.

Chris: The reports make sense to me.

Marjorie: So be it. Then the first item of business would appear to be a review of the Retail Stores channel for selling computer games, where we appear to be losing money. Chris, could you brief us on this at our next meeting?

Chris: Yes. I have been suspecting for some time that our retail sales strategy could be improved.

Marjorie: We look forward to hearing your analysis.

Managing Product Innovation at Google

IN BUSINESS

Marissa Mayer, **Google's** vice president for search products and user experience, believes that the company's future success hinges on innovation. She encourages risk-taking and readily acknowledges that 60–80% of the company's new products will fail. However, creating an organizational culture that embraces failure also helps produce the new product introductions that should sustain the company's future sales growth. Google's senior managers can use segmented income statements to identify the unprofitable products that should be discontinued and to track the performance of thriving new product innovations.

Source: Ben Elgin, "So Much Fanfare, So Few Hits," *BusinessWeek*, July 10, 2006, pp. 26–29.

Segmented Financial Information in External Reports

The Financial Accounting Standards Board (FASB) now requires that companies in the United States include segmented financial and other data in their annual reports and that the segmented reports prepared for external users *must use the same methods and definitions that the companies use in internal segmented reports that are prepared to aid in making operating decisions*. This is a very unusual requirement. Companies are not ordinarily required to report the same data to external users that are reported internally for decision-making purposes. This may seem like a reasonable requirement for the FASB to make, but it has some serious drawbacks. First, segmented data are often highly sensitive and companies are reluctant to release such data to the public for the simple reason that their competitors will then have access to the data. Second, segmented statements prepared in accordance with GAAP do not distinguish between fixed and variable costs and between traceable and common costs. Indeed, the segmented income statements illustrated earlier in this chapter do not conform to GAAP for that reason. To avoid the complications of reconciling non-GAAP segment margins with GAAP consolidated earnings, it is likely that at least some managers will choose to construct their segmented financial statements in a manner that conforms with GAAP. This will result in more occurrences of the problems discussed in the following section.



HINDRANCES TO PROPER COST ASSIGNMENT

Costs must be properly assigned to segments. All of the costs attributable to a segment—and only those costs—should be assigned to the segment. Unfortunately, companies often make mistakes when assigning costs to segments. They omit some costs, inappropriately assign traceable fixed costs, and arbitrarily allocate common fixed costs.

Omission of Costs

The costs assigned to a segment should include all costs attributable to that segment from the company's entire value chain. All of these functions, from research and development, through product design, manufacturing, marketing, distribution, and customer service, are required to bring a product or service to the customer and generate revenues.

However, only manufacturing costs are included in product costs under absorption costing, which is widely regarded as required for external financial reporting. To avoid having to maintain two costing systems and to provide consistency between internal and external reports, many companies also use absorption costing for their internal reports such as segmented income statements. As a result, such companies omit from their profitability analysis part or all of the “upstream” costs in the value chain, which consist of research and development and product design, and the “downstream” costs, which consist of marketing, distribution, and customer service. Yet these nonmanufacturing costs are just as essential in determining product profitability as are the manufacturing costs. These upstream and downstream costs, which are usually included in selling and administrative expenses on absorption costing income statements, can represent half or more of the total costs of an organization. If either the upstream or downstream costs are omitted in profitability analysis, then the product is undercosted and management may unwittingly develop and maintain products that in the long run result in losses.

Inappropriate Methods for Assigning Traceable Costs among Segments

In addition to omitting costs, many companies do not correctly handle traceable fixed expenses on segmented income statements. First, they do not trace fixed expenses to segments even when it is feasible to do so. Second, they use inappropriate allocation bases to allocate traceable fixed expenses to segments.

Failure to Trace Costs Directly Costs that can be traced directly to a specific segment should be charged directly to that segment and should not be allocated to other segments. For example, the rent for a branch office of an insurance company should be charged directly to the branch office rather than included in a companywide overhead pool and then spread throughout the company.

Inappropriate Allocation Base Some companies use arbitrary allocation bases to allocate costs to segments. For example, some companies allocate selling and administrative expenses on the basis of sales revenues. Thus, if a segment generates 20% of total company sales, it would be allocated 20% of the company's selling and administrative expenses as its “fair share.” This same basic procedure is followed if cost of goods sold or some other measure is used as the allocation base.

Costs should be allocated to segments for internal decision-making purposes only when the allocation base actually drives the cost being allocated (or is very highly correlated with the real cost driver). For example, sales should be used to allocate selling and administrative expenses only if a 10% increase in sales will result in a 10% increase in selling and administrative expenses. To the extent that selling and administrative expenses are not driven by sales volume, these expenses will be improperly allocated—with a

disproportionately high percentage of the selling and administrative expenses assigned to the segments with the largest sales.

Arbitrarily Dividing Common Costs among Segments

The third business practice that leads to distorted segment costs is the practice of assigning nontraceable costs to segments. For example, some companies allocate the common costs of the corporate headquarters building to products on segment reports. However, in a multiproduct company, no single product is likely to be responsible for any significant amount of this cost. Even if a product were eliminated entirely, there would usually be no significant effect on any of the costs of the corporate headquarters building. In short, there is no cause-and-effect relation between the cost of the corporate headquarters building and the existence of any one product. As a consequence, any allocation of the cost of the corporate headquarters building to the products must be arbitrary.

Common costs like the costs of the corporate headquarters building are necessary, of course, to have a functioning organization. The practice of arbitrarily allocating common costs to segments is often justified on the grounds that “someone” has to “cover the common costs.” While it is undeniably true that the common costs must be covered, arbitrarily allocating common costs to segments does not ensure that this will happen. In fact, adding a share of common costs to the real costs of a segment may make an otherwise profitable segment appear to be unprofitable. If a manager eliminates the apparently unprofitable segment, the real traceable costs of the segment will be saved, but its revenues will be lost. And what happens to the common fixed costs that were allocated to the segment? They don’t disappear; they are reallocated to the remaining segments of the company. That makes all of the remaining segments appear to be less profitable—possibly resulting in dropping other segments. The net effect will be to reduce the overall profits of the company and make it even more difficult to “cover the common costs.”

Additionally, common fixed costs are not manageable by the manager to whom they are arbitrarily allocated; they are the responsibility of higher-level managers. Allocating common fixed costs to responsibility centers is counterproductive in a responsibility accounting system. When common fixed costs are allocated to managers, they are held responsible for those costs even though they cannot control them.

The Big Gouge?

IN BUSINESS

The Big Dig in Boston is a \$14 billion-plus project to bury major roads underground in downtown Boston. Two companies—**Bechtel** and **Parsons Brinckerhoff (PB)**—manage the 20-year project, which is \$1.6 billion over budget. The two companies will likely collect in excess of \$120 million in fixed fees for their work on the project—not including reimbursements for overhead costs. Bechtel and PB have many projects under way at any one time and many common fixed costs. These common fixed costs are not actually caused by the Big Dig project and yet portions of these costs have been claimed as reimbursable expenses. “Bechtel and PB say they don’t collect a penny more for overhead than they are entitled to.” A Bechtel spokesman says, “Our allocation of overhead [on the Big Dig] is rigorously audited . . .” This is undoubtedly true; in practice, fixed common costs are routinely (and arbitrarily) allocated to segments for cost reimbursement and other purposes. Managers at Bechtel, PB, and other companies argue that someone must pay for these costs. While this too is true, who actually pays for these costs will depend on how the common fixed costs are arbitrarily allocated among segments. Massachusetts has lodged a number of complaints concerning Bechtel’s cost recovery claims. Such complaints are almost inevitable when common fixed costs are allocated to segments. It might be better to simply set an all-inclusive fixed fee up front with no cost recovery and hence no issues concerning what costs are really attributable to the project.

Source: Nathan Vardi, “Desert Storm,” *Forbes*, June 23, 2003, pp. 63–66.

In sum, the way many companies handle segment reporting results in cost distortion. This distortion results from three practices—the failure to trace costs directly to a specific segment when it is feasible to do so, the use of inappropriate bases for allocating costs, and the allocation of common costs to segments. These practices are widespread. One study found that 60% of the companies surveyed made no attempt to assign selling and administrative costs to segments on a cause-and-effect basis.³

CONCEPT CHECK



- Managers in which of the following responsibility centers are held responsible for profits? (You may select more than one answer.)
 - Revenue centers
 - Cost centers
 - Profit centers
 - Investment centers
- Which of the following statements is false? (You may select more than one answer.)
 - The same cost can be traceable or common depending on how the segment is defined.
 - In general, common fixed costs should be assigned to segments.
 - If a company eliminates a segment of its business, the costs that were traceable to that segment should disappear.
 - If four segments share \$1 million in common fixed costs and one segment is eliminated, the common fixed costs will decrease by \$250,000.

EVALUATING INVESTMENT CENTER PERFORMANCE— RETURN ON INVESTMENT

LEARNING OBJECTIVE 2

Compute return on investment (ROI) and show how changes in sales, expenses, and assets affect ROI.



Thus far, the chapter has focused on how to properly assign costs to responsibility centers and how to construct segmented income statements. These are vital steps when evaluating cost and profit centers. However, evaluating an investment center's performance requires more than accurate cost and segment margin reporting. In addition, an investment center is responsible for earning an adequate return on investment. The following two sections present two methods for evaluating this aspect of an investment center's performance. The first method, covered in this section, is called *return on investment (ROI)*. The second method, covered in the next section, is called *residual income*.

The Return on Investment (ROI) Formula

Return on investment (ROI) is defined as net operating income divided by average operating assets:

$$\text{ROI} = \frac{\text{Net operating income}}{\text{Average operating assets}}$$

³James R. Emore and Joseph A. Ness, "The Slow Pace of Meaningful Change in Cost Systems," *Journal of Cost Management* 4, no. 4, p. 39.

The higher a business segment's return on investment (ROI), the greater the profit earned per dollar invested in the segment's operating assets.

Net Operating Income and Operating Assets Defined

Note that *net operating income*, rather than net income, is used in the ROI formula. **Net operating income** is income before interest and taxes and is sometimes referred to as EBIT (earnings before interest and taxes). Net operating income is used in the formula because the base (i.e., denominator) consists of *operating assets*. To be consistent, we use net operating income in the numerator.

Operating assets include cash, accounts receivable, inventory, plant and equipment, and all other assets held for operating purposes. Examples of assets that are not included in operating assets (i.e., examples of nonoperating assets) include land held for future use, an investment in another company, or a building rented to someone else. These assets are not held for operating purposes and therefore are excluded from operating assets. The operating assets base used in the formula is typically computed as the average of the operating assets between the beginning and the end of the year.

Most companies use the net book value (i.e., acquisition cost less accumulated depreciation) of depreciable assets to calculate average operating assets. This approach has drawbacks. An asset's net book value decreases over time as the accumulated depreciation increases. This decreases the denominator in the ROI calculation, thus increasing ROI. Consequently, ROI mechanically increases over time. Moreover, replacing old depreciated equipment with new equipment increases the book value of depreciable assets and decreases ROI. Hence, using net book value in the calculation of average operating assets results in a predictable pattern of increasing ROI over time as accumulated depreciation grows and discourages replacing old equipment with new, updated equipment. An alternative to using net book value is the gross cost of the asset, which ignores accumulated depreciation. Gross cost stays constant over time because depreciation is ignored; therefore, ROI does not grow automatically over time, and replacing a fully depreciated asset with a comparably priced new asset will not adversely affect ROI.

Nevertheless, most companies use the net book value approach to computing average operating assets because it is consistent with their financial reporting practices of recording the net book value of assets on the balance sheet and including depreciation as an operating expense on the income statement. In this text, we will use the net book value approach unless a specific exercise or problem directs otherwise.

Understanding ROI

The equation for ROI, net operating income divided by average operating assets, does not provide much help to managers interested in taking actions to improve their ROI. It only offers two levers for improving performance—net operating income and average operating assets. Fortunately, ROI can also be expressed as follows:

$$\text{ROI} = \text{Margin} \times \text{Turnover}$$

where

$$\text{Margin} = \frac{\text{Net operating income}}{\text{Sales}}$$

and

$$\text{Turnover} = \frac{\text{Sales}}{\text{Average operating assets}}$$

Note that the sales terms in the margin and turnover formulas cancel out when they are multiplied together, yielding the original formula for ROI stated in terms of net operating income and average operating assets. So either formula for ROI will give the same answer. However, the margin and turnover formulation provides some additional insights.

From a manager's perspective, **margin** and **turnover** are very important concepts. Margin is ordinarily improved by increasing sales or reducing operating expenses, including cost of goods sold and selling and administrative expenses. The lower the operating expenses per dollar of sales, the higher the margin earned. Some managers tend to focus too much on margin and ignore turnover. However, turnover incorporates a crucial area of a manager's responsibility—the investment in operating assets. Excessive funds tied up in operating assets (e.g., cash, accounts receivable, inventories, plant and equipment, and other assets) depress turnover and lower ROI. In fact, inefficient use of operating assets can be just as much of a drag on profitability as excessive operating expenses, which depress margin.

E.I. du Pont de Nemours and Company (better known as DuPont) pioneered the use of ROI and recognized the importance of looking at both margin and turnover in assessing a manager's performance. ROI is now widely used as the key measure of investment center performance. ROI reflects in a single figure many aspects of the manager's responsibilities. It can be compared to the returns of other investment centers in the organization, the returns of other companies in the industry, and to the past returns of the investment center itself.

DuPont also developed the diagram that appears in Exhibit 10–5. This exhibit helps managers understand how they can improve ROI. Any increase in ROI must involve at least one of the following:

1. Increased sales
2. Reduced operating expenses
3. Reduced operating assets

Many actions involve combinations of changes in sales, expenses, and operating assets. For example, a manager may make an investment in (i.e., increase) operating assets to reduce operating expenses or increase sales. Whether the net effect is favorable or not is judged in terms of its overall impact on ROI.

IN BUSINESS

J. Crew Pulls the ROI Levers

J. CREW

J. Crew has adopted an interesting strategy for improving its ROI. The company has started selling “super-premium products—such as \$1,500 cashmere coats and \$1,500 beaded tunics—in limited editions, sometimes no more than 100 pieces nationwide.” The intentional creation of scarcity causes many items to sell out within weeks as shoppers snatch them up before they are gone for good.

This strategy is helping boost J. Crew's ROI in two ways. First, the company earns higher margins on premium-priced products where customer demand dramatically exceeds supply. Second, the company is slashing its inventories because such small quantities of each item are purchased from suppliers. While J. Crew sacrifices some sales from customers who would have purchased sold-out items, the overall effect on profits has been favorable. “Tighter inventories mean that J. Crew is no longer putting reams of clothes on sale, a move that kills profit margins and trains shoppers to wait for discounts. At one point . . . half of J. Crew's clothing sold at a discount. Today only a small percentage of it does.”

Source: Julia Boorstin, “Mickey Drexler's Second Coming,” *Fortune*, May 2, 2005, pp. 101–104.

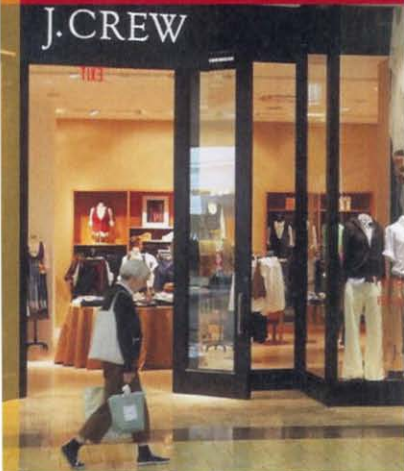
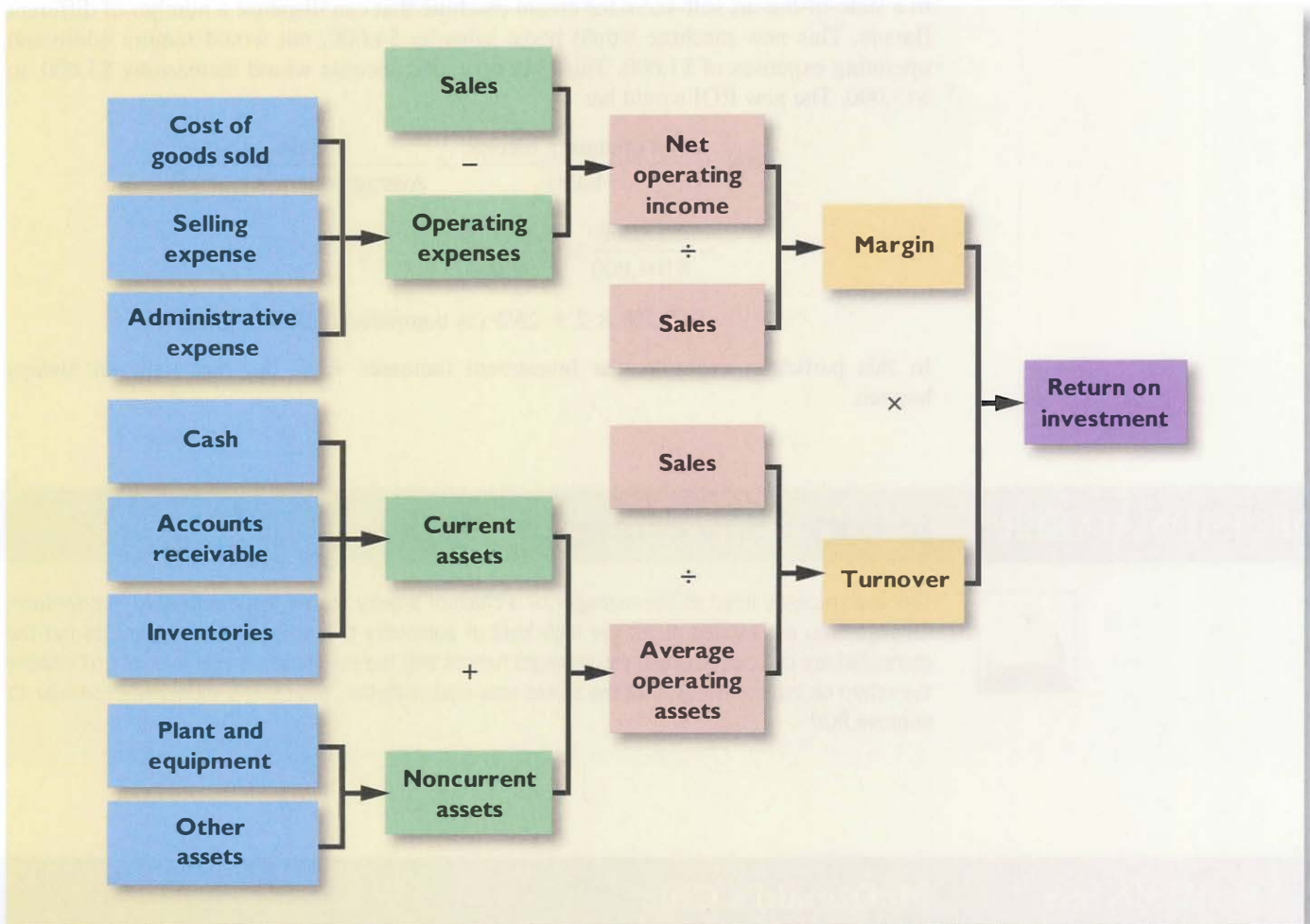


EXHIBIT 10-5 Elements of Return on Investment (ROI)



For example, suppose that the Montvale Burger Grill expects the following operating results next month:



Sales.....	\$100,000
Operating expenses	\$90,000
Net operating income.....	\$10,000
Average operating assets.....	\$50,000

The expected return on investment (ROI) for the month is computed as follows:

$$\begin{aligned}
 \text{ROI} &= \frac{\text{Net operating income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Average operating assets}} \\
 &= \frac{\$10,000}{\$100,000} \times \frac{\$100,000}{\$50,000} \\
 &= 10\% \times 2 = 20\%
 \end{aligned}$$

Suppose that the manager of the Montvale Burger Grill is considering investing \$2,000 in a state-of-the-art soft-serve ice cream machine that can dispense a number of different flavors. This new machine would boost sales by \$4,000, but would require additional operating expenses of \$1,000. Thus, net operating income would increase by \$3,000, to \$13,000. The new ROI would be:

$$\begin{aligned} \text{ROI} &= \frac{\text{Net operating income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Average operating assets}} \\ &= \frac{\$13,000}{\$104,000} \times \frac{\$104,000}{\$52,000} \\ &= 12.5\% \times 2 = 25\% \text{ (as compared to 20\% originally)} \end{aligned}$$

In this particular example, the investment increases ROI, but that will not always happen.

DECISION MAKER

Jewelry Store Manager



You were recently hired as the manager of a chain of jewelry stores that are located in downtown Chicago. You are excited about the high level of autonomy that you have been given to run the stores but are nervous because you've heard rumors that the previous manager was let go because the return on investment (ROI) of the stores was unacceptable. What steps should you consider to improve ROI?

IN BUSINESS

McDonald's Chic

McDonald's France has been spending lavishly to remodel its restaurants to blend with local architecture and to make their interiors less uniform and sterile. For example, some outlets in the Alps have wood-and-stone interiors similar to those of alpine chalets. The idea is to defuse the negative feelings many of the French people have toward McDonald's as a symbol of American culture and, perhaps more importantly, to try to entice customers to linger over their meals and spend more. This investment in operating assets has apparently been successful—even though a Big Mac costs about the same in Paris as in New York, the average French customer spends about \$9 per visit versus only about \$4 in the U.S.

Source: Carol Matlack and Pallavi Gogoi, "What's This? The French Love McDonald's?" *BusinessWeek*, January 13, 2003, p. 50.

Criticisms of ROI

Although ROI is widely used in evaluating performance, it is subject to the following criticisms:

1. Just telling managers to increase ROI may not be enough. Managers may not know how to increase ROI; they may increase ROI in a way that is inconsistent with the company's strategy; or they may take actions that increase ROI in the short run but

- harm the company in the long run (such as cutting back on research and development). This is why ROI is best used as part of a balanced scorecard, as discussed later in this chapter. A balanced scorecard can provide concrete guidance to managers, making it more likely that their actions are consistent with the company's strategy and reducing the likelihood that they will boost short-run performance at the expense of long-term performance.
- 2. A manager who takes over a business segment typically inherits many committed costs over which the manager has no control. These committed costs may be relevant in assessing the performance of the business segment as an investment but they make it difficult to fairly assess the performance of the manager.
- 3. As discussed in the next section, a manager who is evaluated based on ROI may reject investment opportunities that are profitable for the whole company but that would have a negative impact on the manager's performance evaluation.

Shoe Store Manager

YOU DECIDE

You are the manager of a shoe store in a busy shopping mall. The store is part of a national chain that evaluates its store managers on the basis of return on investment (ROI). As the manager of the store, you have control over costs, pricing, and the inventory you carry. The ROI of your store was 17.21% last year and is projected to be 17.00% this year unless some action is taken. The projected ROI has been computed as follows:

Average operating assets (a)	\$2,000,000
Net operating income (b)	\$340,000
ROI, (b) ÷ (a)	17.00%

Your bonus this year will depend on improving your ROI performance over last year. The minimum required rate of return on investment for the national chain is 15%.

You are considering two alternatives for improving this year's ROI:

- a. Cut inventories (and average operating assets) by \$500,000. This will unfortunately result in a reduction in sales, with a negative impact on net operating income of \$79,000.
- b. Add a new product line that would increase average operating assets by \$200,000, but would increase net operating income by \$33,000.

Which alternative would result in your earning a bonus for the year? Which alternative is in the best interests of the national chain?

RESIDUAL INCOME

Residual income is another approach to measuring an investment center's performance. **Residual income** is the net operating income that an investment center earns above the minimum required return on its operating assets. In equation form, residual income is calculated as follows:

$$\text{Residual income} = \text{Net operating income} - \left(\text{Average operating assets} \times \text{Minimum required rate of return} \right)$$

LEARNING OBJECTIVE 3

Compute residual income and understand its strengths and weaknesses.



Economic Value Added (EVA®) is an adaptation of residual income that has been adopted by many companies.⁴ Under EVA, companies often modify their accounting principles in various ways. For example, funds used for research and development are often treated as investments rather than as expenses.⁵ These complications are best dealt with in a more advanced course; in this text we will not draw any distinction between residual income and EVA.

When residual income or EVA is used to measure performance, the objective is to maximize the total amount of residual income or EVA, not to maximize ROI. This is an important distinction. If the objective were to maximize ROI, then every company should divest all of its products except the single product with the highest ROI.



A wide variety of organizations have embraced some version of residual income or EVA, including **Bausch & Lomb, Best Buy, Boise Cascade, Coca-Cola, Dun and Bradstreet, Eli Lilly, Federated Mogul, Georgia-Pacific, Guidant Corporation, Hershey Foods, Husky Injection Molding, J.C. Penney, Kansas City Power & Light, Olin, Quaker Oats, Silicon Valley Bank, Sprint, Toys R Us, Tupperware,** and the **United States Postal Service**. In addition, financial institutions such as **Credit Suisse First Boston** now use EVA—and its allied concept, market value added—to evaluate potential investments in other companies.

For purposes of illustration, consider the following data for an investment center—the Ketchikan Division of Alaskan Marine Services Corporation.

Alaskan Marine Services Corporation
Ketchikan Division
Basic Data for Performance Evaluation

Average operating assets	\$100,000
Net operating income.....	\$20,000
Minimum required rate of return.....	15%

Alaskan Marine Services Corporation has long had a policy of using ROI to evaluate its investment center managers, but it is considering switching to residual income. The controller of the company, who is in favor of the change to residual income, has provided the following table that shows how the performance of the division would be evaluated under each of the two methods:

Alaskan Marine Services Corporation
Ketchikan Division

	Alternative Performance Measures	
	ROI	Residual Income
Average operating assets (a)	<u>\$100,000</u>	<u>\$100,000</u>
Net operating income (b)	\$ 20,000	\$ 20,000
ROI, (b) ÷ (a).....	<u>20%</u>	
Minimum required return (15% × \$100,000).....		15,000
Residual income		<u>\$ 5,000</u>

⁴The basic idea underlying residual income and economic value added has been around for over 100 years. In recent years, economic value added has been popularized and trademarked by the consulting firm Stern, Stewart & Co.

⁵Over 100 different adjustments could be made for deferred taxes, LIFO reserves, provisions for future liabilities, mergers and acquisitions, gains or losses due to changes in accounting rules, operating leases, and other accounts, but most companies make only a few. For further details, see John O'Hanlon and Ken Peasnell, "Wall Street's Contribution to Management Accounting: the Stern Stewart EVA® Financial Management System," *Management Accounting Research* 9, 1998, pp. 421-444.

The reasoning underlying the residual income calculation is straightforward. The company is able to earn a rate of return of at least 15% on its investments. Because the company has invested \$100,000 in the Ketchikan Division in the form of operating assets, the company should be able to earn at least \$15,000 (15% × \$100,000) on this investment. Because the Ketchikan Division’s net operating income is \$20,000, the residual income above and beyond the minimum required return is \$5,000. If residual income is adopted as the performance measure to replace ROI, the manager of the Ketchikan Division would be evaluated based on the growth in residual income from year to year.

Motivation and Residual Income

One of the primary reasons why the controller of Alaskan Marine Services Corporation would like to switch from ROI to residual income relates to how managers view new investments under the two performance measurement schemes. The residual income approach encourages managers to make investments that are profitable for the entire company but that would be rejected by managers who are evaluated using the ROI formula.

To illustrate this problem with ROI, suppose that the manager of the Ketchikan Division is considering purchasing a computerized diagnostic machine to aid in servicing marine diesel engines. The machine would cost \$25,000 and is expected to generate additional operating income of \$4,500 a year. From the standpoint of the company, this would be a good investment because it promises a rate of return of 18% (\$4,500 ÷ \$25,000), which exceeds the company’s minimum required rate of return of 15%.

If the manager of the Ketchikan Division is evaluated based on residual income, she would be in favor of the investment in the diagnostic machine as shown below:

Alaskan Marine Services Corporation Ketchikan Division Performance Evaluated Using Residual Income			
	Present	New Project	Overall
Average operating assets	\$100,000	\$25,000	\$125,000
Net operating income	\$ 20,000	\$ 4,500	\$ 24,500
Minimum required return.....	15,000	3,750*	18,750
Residual income	\$ 5,000	\$ 750	\$ 5,750

*\$25,000 × 15% = \$3,750.

Because the project would increase the residual income of the Ketchikan Division by \$750, the manager would choose to invest in the new diagnostic machine.

Now suppose that the manager of the Ketchikan Division is evaluated based on ROI. The effect of the diagnostic machine on the division’s ROI is computed below:

Alaskan Marine Services Corporation Ketchikan Division Performance Evaluated Using ROI			
	Present	New Project	Overall
Average operating assets (a)	\$100,000	\$25,000	\$125,000
Net operating income (b).....	\$20,000	\$4,500	\$24,500
ROI, (b) ÷ (a)	20%	18%	19.6%

The new project reduces the division’s ROI from 20% to 19.6%. This happens because the 18% rate of return on the new diagnostic machine, while above the company’s 15% minimum required rate of return, is below the division’s current ROI of 20%. Therefore, the new diagnostic machine would decrease the division’s ROI even though it would

be a good investment from the standpoint of the company as a whole. If the manager of the division is evaluated based on ROI, she will be reluctant to even propose such an investment.

Generally, a manager who is evaluated based on ROI will reject any project whose rate of return is below the division's current ROI even if the rate of return on the project is above the company's minimum required rate of return. In contrast, managers who are evaluated using residual income will pursue any project whose rate of return is above the minimum required rate of return because it will increase their residual income. Because it is in the best interests of the company as a whole to accept any project whose rate of return is above the minimum required rate of return, managers who are evaluated based on residual income will tend to make better decisions concerning investment projects than managers who are evaluated based on ROI.

Divisional Comparison and Residual Income

The residual income approach has one major disadvantage. It can't be used to compare the performance of divisions of different sizes. Larger divisions often have more residual income than smaller divisions, not necessarily because they are better managed but simply because they are bigger.

As an example, consider the following residual income computations for the Wholesale Division and the Retail Division of Sisal Marketing Corporation:

	Wholesale Division	Retail Division
Average operating assets (a).....	<u>\$1,000,000</u>	<u>\$250,000</u>
Net operating income	\$ 120,000	\$ 40,000
Minimum required return: 10% × (a)	<u>100,000</u>	<u>25,000</u>
Residual income.....	<u>\$ 20,000</u>	<u>\$ 15,000</u>

Observe that the Wholesale Division has slightly more residual income than the Retail Division, but that the Wholesale Division has \$1,000,000 in operating assets as compared to only \$250,000 in operating assets for the Retail Division. Thus, the Wholesale Division's greater residual income is probably due to its larger size rather than the quality of its management. In fact, it appears that the smaller division may be better managed because it has been able to generate nearly as much residual income with only one-fourth

CONCEPT CHECK

- Last year sales were \$300,000, net operating income was \$75,000, and average operating assets were \$500,000. If sales next year remain the same as last year and expenses and average operating assets are reduced by 5%, what will be the return on investment next year?
 - 12.2%
 - 18.2%
 - 20.2%
 - 25.2%
- Referring to the facts in question 3 above, if the minimum required rate of return is 12%, what will be the residual income next year?
 - \$26,250
 - \$27,250
 - \$28,250
 - \$29,250

as much in operating assets. When comparing investment centers, it is probably better to focus on the percentage change in residual income from year to year rather than on the absolute amount of the residual income.

Many organizations now integrate financial measures such as ROI and residual income in a coordinated system of performance measures known as a *balanced scorecard*.

BALANCED SCORECARD

A **balanced scorecard** consists of an integrated set of performance measures that are derived from and support the company's strategy. A strategy is essentially a theory about how to achieve the organization's goals. For example, **Southwest Airlines'** strategy is to offer an *operational excellence* customer value proposition that has three key components—low ticket prices, convenience, and reliability. The company operates only one type of aircraft, the Boeing 737, to reduce maintenance and training costs and simplify scheduling. It further reduces costs by not offering meals, seat assignments, or baggage transfers and by booking a large portion of its passenger revenue over the Internet. Southwest also uses point-to-point flights rather than the hub-and-spoke approach of its larger competitors, thereby providing customers convenient, non-stop service to their final destination. Because Southwest serves many less-congested airports such as Chicago Midway, Burbank, Manchester, Oakland, and Providence, it offers quicker passenger check-ins and reliable departures, while maintaining high asset utilization (i.e., the company's average gate turnaround time of 25 minutes enables it to function with fewer planes and gates). Overall, the company's strategy has worked. At a time when Southwest Airlines' larger competitors are struggling, it continues to earn substantial profits.

Under the balanced scorecard approach, top management translates its strategy into performance measures that employees can understand and influence. For example, the amount of time passengers have to wait in line to have their baggage checked might be a performance measure for the supervisor in charge of the Southwest Airlines check-in counter at the Burbank airport. This performance measure is easily understood by the supervisor, and can be improved by the supervisor's actions.

LEARNING OBJECTIVE 4

Understand how to construct and use a balanced scorecard.



Why Do Companies Fail to Execute Their Strategies?

IN BUSINESS

Robert Paladino served as the vice president and global leader of the Telecommunications and Utility Practice for the **Balanced Scorecard Collaborative**—a consulting organization that works with companies to implement balanced scorecards. He offers four reasons why nine out of ten organizations fail to execute their business strategies.

First, only 5% of a company's workforce understands their organization's strategy. Paladino commented "if employees don't understand the strategic objectives, then they could be focused on closing the wrong performance gaps." Second, 85% of management teams spend less than one hour per month discussing strategy. Managers cannot effectively implement strategies if they do not spend enough time talking about them. Third, 60% of organizations do not link their budgets to strategy. The inevitable result is that companies pursue "financial strategies that differ from or, worse, may be in conflict with their business and customer quality strategies." Finally, only 25% of managers have their incentives linked to strategy. Thus, most managers are working to maximize their compensation by improving strategically misguided metrics.

Paladino says the balanced scorecard overcomes these four barriers because it helps employees focus their actions on executing organizational strategies.

Source: Robert E. Paladino, "Balanced Forecasts Drive Value," *Strategic Finance*, January 2005, pp. 37–42.



Common Characteristics of Balanced Scorecards

Performance measures used in the balanced scorecard approach tend to fall into the four groups illustrated in Exhibit 10-6: financial, customer, internal business processes, and learning and growth. Internal business processes are what the company does in an attempt to satisfy customers. For example, in a manufacturing company, assembling a product is an internal business process. In an airline, handling baggage is an internal business process. The idea underlying these groupings (as indicated by the vertical arrows in Exhibit 10-6) is that learning is necessary to improve internal business processes; improving business processes is necessary to improve customer satisfaction; and improving customer satisfaction is necessary to improve financial results.

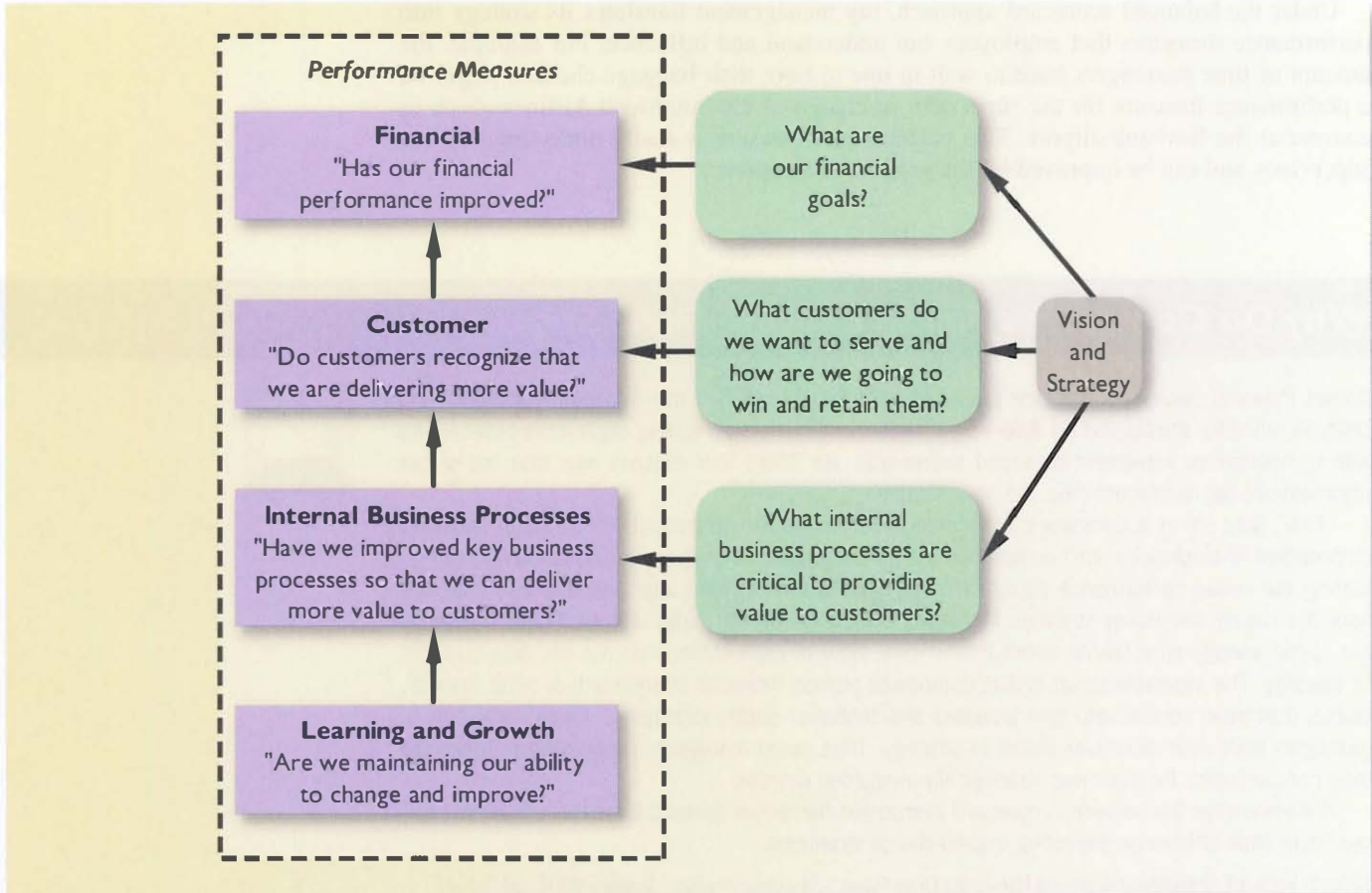
Note that the emphasis in Exhibit 10-6 is on *improvement*—not on just attaining some specific objective such as profits of \$10 million. In the balanced scorecard approach, continual improvement is encouraged. If an organization does not continually improve, it will eventually lose out to competitors that do.



Financial performance measures appear at the top of Exhibit 10-6. Ultimately, most companies exist to provide financial rewards to owners. There are exceptions. Some companies—for example, **The Body Shop**—may have loftier goals such as providing environmentally friendly products to consumers. However, even nonprofit organizations must generate enough financial resources to stay in operation.

However, for several reasons, financial performance measures are not sufficient in themselves—they should be integrated with nonfinancial measures in a well-designed balanced scorecard. First, financial measures are lag indicators that report on the results

EXHIBIT 10-6 From Strategy to Performance Measures: The Balanced Scorecard



of past actions. In contrast, nonfinancial measures of key success drivers such as customer satisfaction are leading indicators of future financial performance. Second, top managers are ordinarily responsible for the financial performance measures—not lower-level managers. The supervisor in charge of checking in passengers can be held responsible for how long passengers have to wait in line. However, this supervisor cannot reasonably be held responsible for the entire company's profit. That is the responsibility of the airline's top managers.

Exhibit 10-7 lists some examples of performance measures that can be found on the balanced scorecards of companies. However, few companies, if any, would use all of these performance measures, and almost all companies would add other performance measures.

Customer Perspective	
Performance Measure	Desired Change
Customer satisfaction as measured by survey results	+
Number of customer complaints	-
Market share	+
Product returns as a percentage of sales	-
Percentage of customers retained from last period	+
Number of new customers	+
Internal Business Processes Perspective	
Performance Measure	Desired Change
Percentage of sales from new products	+
Time to introduce new products to market	-
Percentage of customer calls answered within 20 seconds	+
On-time deliveries as a percentage of all deliveries	+
Work in process inventory as a percentage of sales	-
Unfavorable standard cost variances	-
Defect-free units as a percentage of completed units	+
Delivery cycle time	-
Throughput time	-
Manufacturing cycle efficiency	+
Quality costs	-
Setup time	-
Time from call by customer to repair of product	-
Percent of customer complaints settled on first contact	+
Time to settle a customer claim	-
Learning and Growth Perspective	
Performance Measure	Desired Change
Suggestions per employee	+
Employee turnover	-
Hours of in-house training per employee	+

EXHIBIT 10-7

Examples of Performance Measures for Balanced Scorecards

Managers should carefully select performance measures for their own company's balanced scorecard, keeping the following points in mind. First and foremost, the performance measures should be consistent with, and follow from, the company's strategy. If the performance measures are not consistent with the company's strategy, people will find themselves working at cross-purposes. Second, the performance measures should be understandable and controllable to a significant extent by those being evaluated. Third, the scorecard should not have too many performance measures. This can lead to a lack of focus and confusion.

While the entire organization will have an overall balanced scorecard, each responsible individual will have his or her own personal scorecard as well. This scorecard should consist of items the individual can personally influence that relate directly to the performance measures on the overall balanced scorecard. The performance measures on this personal scorecard should not be overly influenced by actions taken by others in the company or by events that are outside of the individual's control. And, focusing on the performance measure should not lead an individual to take actions that are counter to the organization's objectives.

With those broad principles in mind, we will now take a look at how a company's strategy affects its balanced scorecard.

IN BUSINESS

Losing Sight of the Customer

Understanding customer needs sounds simple enough, but it is surprising how often companies lose sight of what their customers want. For example, **Waste Management**, one of the largest trash haulers in the United States, assumed that its customers were most interested in low prices. However, when the company actually surveyed its customers, it found out that they were more concerned about billing errors and missed garbage pickups. Waste Management responded to this feedback by upgrading its billing program—as a result customers are paying their bills in an average of 47 days instead of 71. Not only are customers happier with fewer billing errors, but shaving 24 days off the accounts receivable collection cycle is worth \$30 million per day to the company!

Waste Management also addressed the issue of missed garbage pickups by initiating a program called Haul or Call. When a garbage truck driver sees an impediment blocking a garbage bin, his home office calls the customer to see when they can reschedule a pickup. Customers have been so impressed with this level of service that their defection rate has dropped from 12% to 8.6% in less than one year.

Waste Management has found that the key to improving bottom-line results is gathering information from its customers about the underlying drivers of financial performance.

Source: Julie Creswell, "Scandal Hits—Now What?" *Fortune*, July 7, 2003, pp. 127–130.

A Company's Strategy and the Balanced Scorecard

Returning to the performance measures in Exhibit 10–6, each company must decide which customers to target and what internal business processes are crucial to attracting and retaining those customers. Different companies, having different strategies, will target different customers with different kinds of products and services. Take the automobile industry as an example. **BMW** stresses engineering and handling; **Volvo**, safety; **Jaguar**, luxury detailing; and **Toyota**, reliability. Because of these differences in emphasis, a one-size-fits-all approach to performance measurement won't work even within this one industry. Performance measures must be tailored to the specific strategy of each company.

Suppose, for example, that Jaguar's strategy is to offer distinctive, richly finished luxury automobiles to wealthy individuals who prize handcrafted, individualized products. To deliver this customer intimacy value proposition to its wealthy target customers,

Jaguar might create such a large number of options for details, such as leather seats, interior and exterior color combinations, and wooden dashboards, that each car becomes virtually one of a kind. For example, instead of just offering tan or blue leather seats in standard cowhide, the company may offer customers the choice of an almost infinite palette of colors in any of a number of different exotic leathers. For such a system to work effectively, Jaguar would have to be able to deliver a completely customized car within a reasonable amount of time—and without incurring more cost for this customization than the customer is willing to pay. Exhibit 10–8 suggests how Jaguar might reflect this strategy in its balanced scorecard.

If the balanced scorecard is correctly constructed, the performance measures should be linked together on a cause-and-effect basis. Each link can then be read as a hypothesis in the form “If we improve this performance measure, then this other performance measure should also improve.” Starting from the bottom of Exhibit 10–8, we can read the links between performance measures as follows. If employees acquire the skills to install new options more effectively, then the company can offer more options and the options can be installed in less time. If more options are available and they are installed in less time, then customer surveys should show greater satisfaction with the range of options available. If more options are available and they are installed in less time, then the number of cars sold should increase. If customer surveys show greater satisfaction with the range of options available, then the number of cars sold should increase. If the number of cars sold increases, then the contribution margin per car should increase. Finally, if the contribution margin per car increases, then the residual income should increase. In addition,

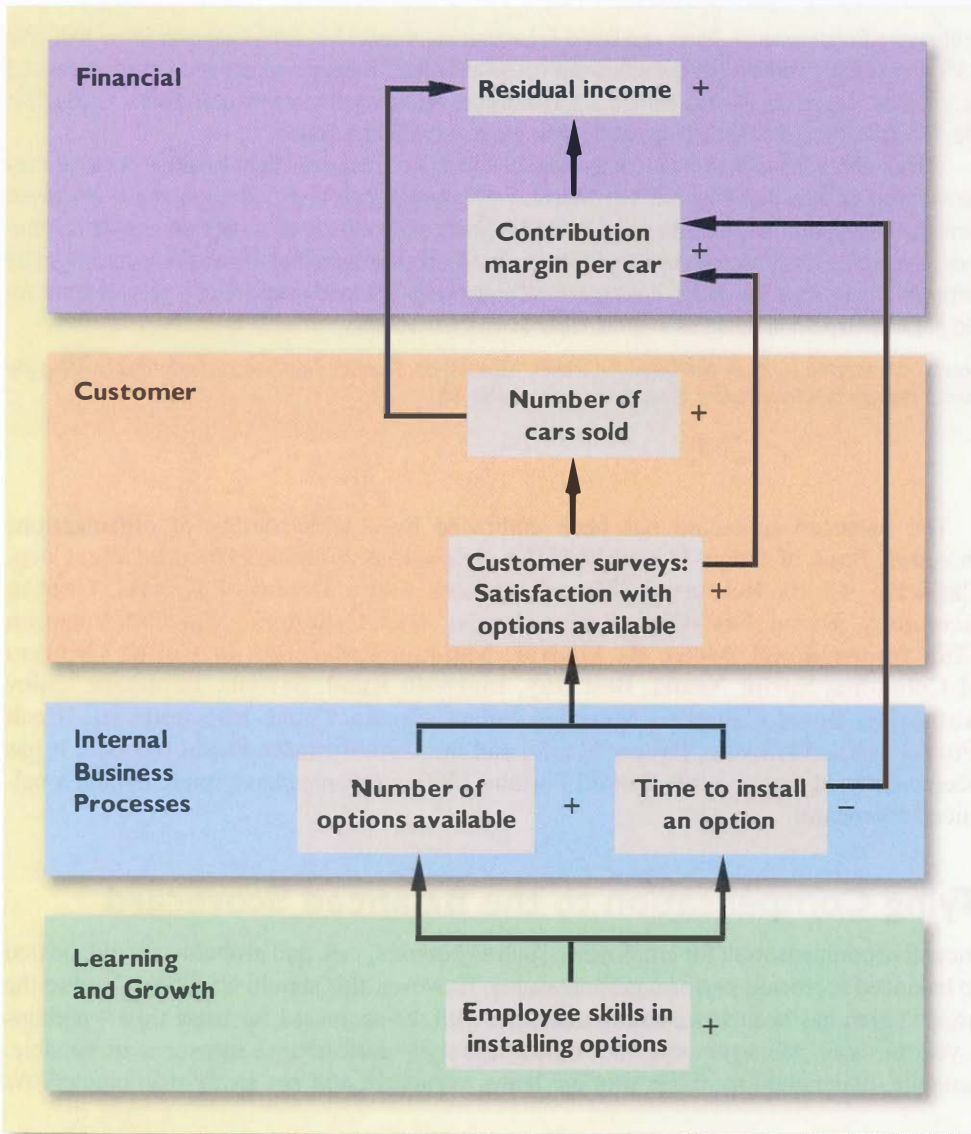


EXHIBIT 10-8
A Possible Strategy at Jaguar and the Balanced Scorecard

if customer satisfaction improves, the company should be able to maintain or increase its selling prices, and if the time to install options decreases, the costs of installing the options should decrease. Together, this should result in an increase in the contribution margin per car. If the contribution margin per car increases and more cars are sold, the result should be an increase in residual income.

In essence, the balanced scorecard lays out a theory of how the company can take concrete actions to attain its desired outcomes (financial, in this case). While the strategy laid out in Exhibit 10–8 seems plausible, it should be regarded as only a theory. For example, if the company succeeds in increasing the number of options available and in decreasing the time required to install options and yet there is no increase in customer satisfaction, the number of cars sold, the contribution margin per car, or residual income, the strategy would have to be reconsidered. One of the advantages of the balanced scorecard is that it continually tests the theories underlying management's strategy. If a strategy is not working, it should become evident when some of the predicted effects (i.e., more car sales) don't occur. Without this feedback, the organization may drift on indefinitely with an ineffective strategy based on faulty assumptions.

IN BUSINESS

Cause-and-Effect Is the Key

Professors Christopher D. Ittner and David F. Larcker surveyed 157 companies and found that only 23% consistently verified the hypothesized cause-and-effect linkages embedded in their balanced scorecards. These companies earned a 5.14% higher return on common stockholders' equity than the 77% of companies that did not verify their cause-and-effect linkages.

The authors found that most companies do not verify cause-and-effect linkages because they erroneously believe that they are self-evident. For example, one fast-food chain chose employee turnover as a performance measure believing that its positive effects on profits were obvious. However, the professors' research revealed that the fast-food chain's profitability was only influenced by turnover among its supervisors, not lower-level employees. A broad measure of employee turnover did not help explain differences in profitability across restaurants.

Source: Christopher D. Ittner and David F. Larcker, "Coming Up Short on Nonfinancial Performance Measurement," *Harvard Business Review*, November 2003, pp. 88–95.

The balanced scorecard has been embraced by a wide variety of organizations including **Bank of Tokyo-Mitsubishi UFJ, Brigham & Women's Hospital, KeyCorp, Chielectra, China Resources Microelectronics, Delta Dental of Kansas, Gerdau Acominas, Korea East-West Power, Luxfer Gas Cylinders, Marriott Vacation Club International, Metro de Madrid, National Federation of Coffee Growers of Colombia, Sprint Nextel, Best Buy, Ingersoll Rand, Serono, Tennessee Valley Authority, Royal Canadian Mounted Police, Crown Castle International, Ricoh Corporation, Mobistar, Hilton Hotels, and the United States Postal Service.** It has been estimated that about half of all Fortune 1000 companies have implemented a balanced scorecard.

Tying Compensation to the Balanced Scorecard

Incentive compensation for employees, such as bonuses, can, and probably should, be tied to balanced scorecard performance measures. However, this should be done only after the organization has been successfully managed with the scorecard for some time—perhaps a year or more. Managers must be confident that the performance measures are reliable, sensible, understood by those who are being evaluated, and not easily manipulated. As

Robert Kaplan and David Norton, the originators of the balanced scorecard concept point out, “compensation is such a powerful lever that you have to be pretty confident that you have the right measures and have good data for the measures before making the link.”⁶

Advantages of Timely and Graphic Feedback

Whatever performance measures are used, they should be reported on a frequent and timely basis. For example, data about defects should be reported to the responsible managers at least once a day so that action can be quickly taken if an unusual number of defects occurs. In the most advanced companies, any defect is reported *immediately*, and its cause is tracked down before any more defects occur. Another common characteristic of the performance measures under the balanced scorecard approach is that managers focus on *trends* in the performance measures over time. The emphasis is on progress and *improvement* rather than on meeting any specific standard.

A Picture Is Worth a Thousand Numbers

IN BUSINESS

Graphics are routinely integrated in Balanced Scorecard reports, with data often displayed on a “dashboard” with representations of gauges and digital readouts. At **Beverage Can Americas Co.** in Chicago, a division of London-based **Rexam Plc.**, executive dashboards and scorecards are being rolled out to thousands of employees. “Each worker sees a handful of metrics that pertain to his or her job, which are represented as green, yellow, or red icons depending on whether they are satisfactory, borderline, or subpar.”

Source: Scott Leibs, “Now You See It,” *CFO*, July 2002, pp. 61–66.

Corporate Governance and the Balanced Scorecard

IN BUSINESS

Historically, the board of directors of **First Commonwealth Financial Corporation** of Pennsylvania had only been given access to financial measures that were required for regulatory purposes. In the aftermath of corporate scandals such as **Enron**, **Tyco**, and **WorldCom**, the board decided to improve its oversight of the corporation by creating a balanced scorecard that not only helped ensure regulatory compliance but that also included forward-looking information about the company’s strategy execution.

The board’s scorecard had four main perspectives—learning and growth, internal, stakeholder, and financial. The internal perspective included three main processes—performance oversight, executive enhancement, and compliance and communication. For performance oversight, the board created measures related to approving strategies and overseeing execution and approving and monitoring funding for strategic initiatives. The executive enhancement measures focused on evaluating and rewarding executive performance and overseeing succession planning for key positions. The compliance and communication measures related to ensuring clear and reliable corporate disclosures and actively monitoring risk and regulatory compliance.

Source: Robert S. Kaplan and Michael Nagel, “First Commonwealth Financial Corporation,” *Harvard Business School Publishing*, 2003, pp. 1–30.

⁶Lori Calabro, “On Balance: A CFO Interview,” *CFO*, February 2001, pp. 73–78.

SUMMARY

LO1 Prepare a segmented income statement using the contribution format, and explain the difference between traceable fixed costs and common fixed costs.

Segmented income statements provide information for evaluating the profitability and performance of divisions, product lines, sales territories, and other segments of a company. Under the contribution approach covered in this chapter, variable costs and fixed costs are clearly distinguished from each other and only those costs that are traceable to a segment are assigned to the segment. A cost is considered traceable to a segment only if the cost is caused by the segment and could be avoided by eliminating the segment. Fixed common costs are not allocated to segments. The segment margin consists of revenues, less variable expenses, less traceable fixed expenses of the segment.

LO2 Compute return on investment (ROI) and show how changes in sales, expenses, and assets affect ROI.

Return on investment (ROI) is defined as net operating income divided by average operating assets. Alternatively, it can be defined as the product of margin and turnover, where margin is net operating income divided by sales and turnover is sales divided by average operating assets.

The relations among sales, expenses, assets, and ROI are complex. The effect of a change in any one variable on the others will depend on the specific circumstances. Nevertheless, an increase in sales often leads to an increase in ROI via the effect of sales on net operating income. If the organization has significant fixed costs, then a given percentage increase in sales is likely to have an even larger percentage effect on net operating income.

LO3 Compute residual income and understand its strengths and weaknesses.

Residual income is the difference between net operating income and the minimum required return on average operating assets. The minimum required return on average operating assets is computed by applying the minimum rate of return to the average operating assets.

A major advantage of residual income over ROI is that it encourages investment in projects whose rates of return are above the minimum required rate of return for the entire organization, but below the segment's current ROI.

LO4 Understand how to construct and use a balanced scorecard.

A balanced scorecard is an integrated system of performance measures designed to support an organization's strategy. The various measures in a balanced scorecard should be linked on a plausible cause-and-effect basis from the very lowest level up through the organization's ultimate objectives. The balanced scorecard is essentially a theory about how specific actions taken by various people in the organization will further the organization's objectives. The theory should be viewed as tentative and subject to change if the actions do not in fact result in improvements in the organization's financial and other goals. If the theory changes, then the performance measures on the balanced scorecard should also change. The balanced scorecard is a dynamic measurement system that evolves as an organization learns more about what works and what doesn't work and refines its strategy accordingly.

GUIDANCE ANSWERS TO DECISION MAKER AND YOU DECIDE

Jewelry Store Manager (p. 474)

Three approaches can be used to increase ROI:

1. Increase sales—An increase in sales will positively impact the margin if expenses increase proportionately less than sales. An increase in sales will also favorably affect turnover if there is not a proportionate increase in operating assets.

2. **Reduce expenses**—This approach is often the first path selected by managers to increase profitability and ROI. You should start by reviewing the stores' discretionary fixed costs (such as advertising). It may be possible to cut some discretionary fixed costs with minimal damage to the long-run goals of the organization. You should also investigate whether there are adequate physical controls over the inventory of jewelry items. Thefts result in an increase in cost of goods sold without a corresponding increase in sales!
3. **Reduce operating assets**—An excessive investment in operating assets (such as inventory) reduces turnover and hurts ROI. Given the nature of the operations of retail jewelry stores, inventory must be in sufficient quantities at specific times during the year (such as Christmas, Valentine's Day, and Mother's Day) or sales will suffer. However, those levels do not need to be maintained throughout the year.

Shoe Store Manager (p.475)

The effects of the two alternatives on your store's ROI for the year can be computed as follows:

	Present	Alternative (a)	Overall
Average operating assets (a).....	\$2,000,000	\$(500,000)	\$1,500,000
Net operating income (b)	\$340,000	\$(79,000)	\$261,000
ROI, (b) ÷ (a).....	17.00%	15.80%	17.40%

	Present	Alternative (b)	Overall
Average operating assets (a).....	\$2,000,000	\$200,000	\$2,200,000
Net operating income (b)	\$340,000	\$33,000	\$373,000
ROI, (b) ÷ (a).....	17.00%	16.50%	16.95%

Alternative (a) would increase your store's ROI to 17.40%—beating last year's ROI and hence earning you a bonus. Alternative (b) would actually decrease your store's ROI and would result in no bonus for the year. So to earn the bonus, you would select Alternative (a). However, this alternative is not in the best interests of the national chain since the ROI of the lost sales is 15.8%, which exceeds the national chain's minimum required rate of return of 15%. Rather, it would be in the national chain's interests to adopt Alternative (b)—the addition of a new product line. The ROI on these sales would be 16.5%, which exceeds the minimum required rate of return of 15%.

GUIDANCE ANSWERS TO CONCEPT CHECKS

1. **Choices c and d.** Both profit and investment center managers are held responsible for profits. In addition, an investment center manager is held responsible for earning an adequate return on investment or residual income.
2. **Choices b and d.** Common fixed costs should not be assigned to segments. Common fixed costs will not decrease if a segment is discontinued.
3. **Choice b.** The net operating income would be $\$300,000 - (\$225,000 \times 95\%) = \$86,250$. The return on investment would be $(\$86,250 \div (\$500,000 \times 95\%)) = 18.2\%$.
4. **Choice d.** The residual income would be $\$86,250 - (\$475,000 \times 12\%) = \$29,250$.



REVIEW PROBLEM I: SEGMENTED STATEMENTS

The business staff of the law firm Frampton, Davis & Smythe has constructed the following report which breaks down the firm's overall results for last month into two main business segments—family law and commercial law:

	Total	Family Law	Commercial Law
Revenues from clients	\$1,000,000	\$400,000	\$600,000
Variable expenses	220,000	100,000	120,000
Contribution margin	780,000	300,000	480,000
Traceable fixed expenses	670,000	280,000	390,000
Segment margin	110,000	20,000	90,000
Common fixed expenses	60,000	24,000	36,000
Net operating income	\$ 50,000	\$ (4,000)	\$ 54,000

However, this report is not quite correct. The common fixed expenses such as the managing partner's salary, general administrative expenses, and general firm advertising have been allocated to the two segments based on revenues from clients.

Required:

1. Redo the segment report, eliminating the allocation of common fixed expenses. Would the firm be better off financially if the family law segment were dropped? (Note: Many of the firm's commercial law clients also use the firm for their family law requirements such as drawing up wills.)
2. The firm's advertising agency has proposed an ad campaign targeted at boosting the revenues of the family law segment. The ad campaign would cost \$20,000, and the advertising agency claims that it would increase family law revenues by \$100,000. The managing partner of Frampton, Davis & Smythe believes this increase in business could be accommodated without any increase in fixed expenses. Estimate the effect this ad campaign would have on the family law segment margin and on the firm's overall net operating income.

Solution to Review Problem I

1. The corrected segmented income statement appears below:

	Total	Family Law	Commercial Law
Revenues from clients	\$1,000,000	\$400,000	\$600,000
Variable expenses	220,000	100,000	120,000
Contribution margin	780,000	300,000	480,000
Traceable fixed expenses	670,000	280,000	390,000
Segment margin	110,000	\$ 20,000	\$ 90,000
Common fixed expenses	60,000		
Net operating income	\$ 50,000		

No, the firm would not be financially better off if the family law practice were dropped. The family law segment is covering all of its own costs and is contributing \$20,000 per month to covering the common fixed expenses of the firm. While the segment margin for family law is much lower than for commercial law, it is still profitable. Moreover, family law may be a service that the firm must provide to its commercial clients in order to remain competitive.

2. The ad campaign can be estimated to increase the family law segment margin by \$55,000 as follows:

Increased revenues from clients	\$100,000
Family law contribution margin ratio (\$300,000 ÷ \$400,000)	× 75%
Incremental contribution margin	\$ 75,000
Less cost of the ad campaign	20,000
Increased segment margin.....	<u>\$ 55,000</u>

Because there would be no increase in fixed expenses (including common fixed expenses), the increase in overall net operating income is also \$55,000.

REVIEW PROBLEM 2: RETURN ON INVESTMENT (ROI) AND RESIDUAL INCOME

The Magnetic Imaging Division of Medical Diagnostics, Inc., has reported the following results for last year's operations:

Sales.....	\$25 million
Net operating income	\$3 million
Average operating assets	\$10 million

Required:

1. Compute the Magnetic Imaging Division's margin, turnover, and ROI.
2. Top management of Medical Diagnostics, Inc., has set a minimum required rate of return on average operating assets of 25%. What is the Magnetic Imaging Division's residual income for the year?

Solution to Review Problem 2

1. The required calculations follow:

$$\begin{aligned} \text{Margin} &= \frac{\text{Net operating income}}{\text{Sales}} \\ &= \frac{\$3,000,000}{\$25,000,000} \\ &= 12\% \end{aligned}$$

$$\begin{aligned} \text{Turnover} &= \frac{\text{Sales}}{\text{Average operating assets}} \\ &= \frac{\$25,000,000}{\$10,000,000} \\ &= 2.5 \end{aligned}$$

$$\begin{aligned} \text{ROI} &= \text{Margin} \times \text{Turnover} \\ &= 12\% \times 2.5 \\ &= 30\% \end{aligned}$$

2. The Magnetic Imaging Division's residual income is computed as follows:

Average operating assets.....	<u>\$10,000,000</u>
Net operating income	\$ 3,000,000
Minimum required return (25% × \$10,000,000).....	<u>2,500,000</u>
Residual income	<u>\$ 500,000</u>

GLOSSARY

- Balanced scorecard** An integrated set of performance measures that are derived from and support the organization's strategy. (p. 479)
- Common fixed cost** A fixed cost that supports more than one business segment, but is not traceable in whole or in part to any one of the business segments. (p. 463)
- Cost center** A business segment whose manager has control over cost but has no control over revenue or investments in operating assets. (p. 455)
- Decentralized organization** An organization in which decision-making authority is not confined to a few top executives but rather is spread throughout the organization. (p. 454)
- Economic Value Added (EVA™)** A concept similar to residual income in which a variety of adjustments may be made to GAAP financial statements for performance evaluation purposes. (p. 476)
- Investment center** A business segment whose manager has control over cost, revenue, and investments in operating assets. (p. 456)
- Margin** Net operating income divided by sales. (p. 472)
- Net operating income** Income before interest and income taxes have been deducted. (p. 471)
- Operating assets** Cash, accounts receivable, inventory, plant and equipment, and all other assets held for operating purposes. (p. 471)
- Profit center** A business segment whose manager has control over cost and revenue but has no control over investments in operating assets. (p. 456)
- Residual income** The net operating income that an investment center earns above the minimum required return on its operating assets. (p. 475)
- Responsibility center** Any business segment whose manager has control over costs, revenues, or investments in operating assets. (p. 455)
- Return on investment (ROI)** Net operating income divided by average operating assets. It also equals margin multiplied by turnover. (p. 470)
- Segment** Any part or activity of an organization about which managers seek cost, revenue, or profit data. (p. 457)
- Segment margin** A segment's contribution margin less its traceable fixed costs. It represents the margin available after a segment has covered all of its own traceable costs. (p. 465)
- Traceable fixed cost** A fixed cost that is incurred because of the existence of a particular business segment and that would be eliminated if the segment were eliminated. (p. 463)
- Turnover** Sales divided by average operating assets. (p. 472)

QUESTIONS

- 10-1 What is meant by the term *decentralization*?
- 10-2 What benefits result from decentralization?
- 10-3 Distinguish between a cost center, a profit center, and an investment center.
- 10-4 What is a segment of an organization? Give several examples of segments.
- 10-5 What costs are assigned to a segment under the contribution approach?
- 10-6 Distinguish between a traceable cost and a common cost. Give several examples of each.
- 10-7 Explain how the segment margin differs from the contribution margin.
- 10-8 Why aren't common costs allocated to segments under the contribution approach?
- 10-9 How is it possible for a cost that is traceable to a segment to become a common cost if the segment is divided into further segments?
- 10-10 What is meant by the terms *margin* and *turnover* in ROI calculations?
- 10-11 What is meant by residual income?
- 10-12 In what way can the use of ROI as a performance measure for investment centers lead to bad decisions? How does the residual income approach overcome this problem?
- 10-13 Why do the measures used in a balanced scorecard differ from company to company?
- 10-14 Why does the balanced scorecard include financial performance measures as well as measures of how well internal business processes are doing?



Multiple-choice questions are provided on the text website at www.mhhe.com/brewer5e.

BRIEF EXERCISE 10-1 Basic Segmented Income Statement [LO1]

Royal Lawncare Company produces and sells two packaged products, Weedban and Greengrow. Revenue and cost information relating to the products follow:

	Product	
	Weedban	Greengrow
Selling price per unit.....	\$6.00	\$7.50
Variable expenses per unit.....	\$2.40	\$5.25
Traceable fixed expenses per year	\$45,000	\$21,000

Common fixed expenses in the company total \$33,000 annually. Last year the company produced and sold 15,000 units of Weedban and 28,000 units of Greengrow.

Required:

Prepare a contribution format income statement segmented by product lines.

BRIEF EXERCISE 10-2 Compute the Return on Investment (ROI) [LO2]

Alyeska Services Company, a division of a major oil company, provides various services to the operators of the North Slope oil field in Alaska. Data concerning the most recent year appear below:



Sales.....	\$7,500,000
Net operating income	\$600,000
Average operating assets.....	\$5,000,000

Required:

1. Compute the margin for Alyeska Services Company.
2. Compute the turnover for Alyeska Services Company.
3. Compute the return on investment (ROI) for Alyeska Services Company.

BRIEF EXERCISE 10-3 Residual Income [LO3]

Juniper Design Ltd. of Manchester, England, is a company specializing in providing design services to residential developers. Last year the company had net operating income of £600,000 on sales of £3,000,000. The company's average operating assets for the year were £2,800,000 and its minimum required rate of return was 18%. (The currency used in England is the pound, denoted by £.)

**Required:**

Compute the company's residual income for the year.

BRIEF EXERCISE 10-4 Creating a Balanced Scorecard [LO4]

Mason Paper Company (MPC) manufactures commodity grade papers for use in computer printers and photocopiers. MPC has reported net operating losses for the last two years due to intense price pressure from much larger competitors. The MPC management team—including Kristen Townsend (CEO), Mike Martinez (vice president of Manufacturing), Tom Andrews (vice president of Marketing), and Wendy Chen (CFO)—is contemplating a change in strategy to save the company from impending bankruptcy. Excerpts from a recent management team meeting are shown below:



Townsend: As we all know, the commodity paper manufacturing business is all about economies of scale. The largest competitors with the lowest cost per unit win. The limited capacity of our older machines prohibits us from competing in the high-volume commodity paper grades. Furthermore, expanding our capacity by acquiring a new paper-making machine is out of the question given the extraordinarily high price tag. Therefore, I propose that we abandon cost reduction as a strategic goal and instead pursue manufacturing flexibility as the key to our future success.

Chen: Manufacturing flexibility? What does that mean?

Martinez: It means we have to abandon our “crank out as many tons of paper as possible” mentality. Instead, we need to pursue the low-volume business opportunities that exist in the nonstandard, specialized paper grades. To succeed in this regard, we’ll need to improve our flexibility in three ways. First, we must improve our ability to switch between paper grades. Right now, we require an average of four hours to change over to another paper grade. Timely customer deliveries are a function of changeover performance. Second, we need to expand the range of paper grades that we can manufacture. Currently, we can only manufacture three paper grades. Our customers must perceive that we are a “one-stop shop” that can meet all of their paper grade needs. Third, we will need to improve our yields (e.g., tons of acceptable output relative to total tons processed) in the nonstandard paper grades. Our percentage of waste within these grades will be unacceptably high unless we do something to improve our processes. Our variable costs will go through the roof if we cannot increase our yields!

Chen: Wait just a minute! These changes are going to destroy our equipment utilization numbers!

Andrews: You’re right Wendy; however, equipment utilization is not the name of the game when it comes to competing in terms of flexibility. Our customers don’t care about our equipment utilization. Instead, as Mike just alluded to, they want just-in-time delivery of smaller quantities of a full range of paper grades. If we can shrink the elapsed time from order placement to order delivery and expand our product offerings, it will increase sales from current customers and bring in new customers. Furthermore, we will be able to charge a premium price because of the limited competition within this niche from our cost-focused larger competitors. Our contribution margin per ton should drastically improve!

Martinez: Of course, executing the change in strategy will not be easy. We’ll need to make a substantial investment in training because ultimately it is our people who create our flexible manufacturing capabilities.

Chen: If we adopt this new strategy, it is definitely going to impact how we measure performance. We’ll need to create measures that motivate our employees to make decisions that support our flexibility goals.

Townsend: Wendy, you hit the nail right on the head. For our next meeting, could you pull together some potential measures that support our new strategy?

Required:

1. Contrast MPC’s previous manufacturing strategy with its new manufacturing strategy.
2. Generally speaking, why would a company that changes its strategic goals need to change its performance measurement system as well? What are some examples of measures that would have been appropriate for MPC prior to its change in strategy? Why would those measures fail to support MPC’s new strategy?
3. Using Exhibit 10–8 as a guide, construct a balanced scorecard that would support MPC’s new manufacturing strategy. Use arrows to show the causal links between the performance measures and show whether the performance measure should increase or decrease over time. Feel free to create measures that may not be specifically mentioned in the chapter, but nonetheless make sense given the strategic goals of the company.
4. What hypotheses are built into MPC’s balanced scorecard? Which of these hypotheses do you believe are most questionable and why?

EXERCISES



EXERCISE 10-5 Contrasting Return on Investment (ROI) and Residual Income [LO2, LO3]

Meiji Isetan Corp. of Japan has two regional divisions with headquarters in Osaka and Yokohama. Selected data on the two divisions follow (in millions of yen, denoted by ¥):

	Division	
	Osaka	Yokohama
Sales.....	¥3,000,000	¥9,000,000
Net operating income	¥210,000	¥720,000
Average operating assets.....	¥1,000,000	¥4,000,000

Required:

1. For each division, compute the return on investment (ROI) in terms of margin and turnover. Where necessary, carry computations to two decimal places.
2. Assume that the company evaluates performance using residual income and that the minimum required rate of return for any division is 15%. Compute the residual income for each division.
3. Is Yokohama's greater amount of residual income an indication that it is better managed? Explain.

EXERCISE 10-6 Computing and Interpreting Return on Investment (ROI) [LO2]

Selected operating data for two divisions of Outback Brewing, Ltd., of Australia are given below (the currency is the Australian dollar, denoted here as \$):



	Division	
	Queensland	New South Wales
Sales.....	\$4,000,000	\$7,000,000
Average operating assets.....	\$2,000,000	\$2,000,000
Net operating income	\$360,000	\$420,000
Property, plant, and equipment (net).....	\$950,000	\$800,000

Required:

1. Compute the rate of return for each division using the return on investment (ROI) formula stated in terms of margin and turnover.
2. Which divisional manager seems to be doing the better job? Why?

EXERCISE 10-7 Return on Investment (ROI) [LO2]

Provide the missing data in the following table for a distributor of martial arts products:



	Division		
	Alpha	Bravo	Charlie
Sales.....	\$?	\$11,500,000	\$?
Net operating income	\$?	\$ 920,000	\$210,000
Average operating assets.....	\$800,000	\$?	\$?
Margin.....	4%	?	7%
Turnover	5	?	?
Return on investment (ROI).....	?	20%	14%

EXERCISE 10-8 Evaluating New Investments Using Return on Investment (ROI) and Residual Income [LO2, LO3]

Selected sales and operating data for three divisions of different structural engineering firms are given as follows:



	Division A	Division B	Division C
Sales	\$12,000,000	\$14,000,000	\$25,000,000
Average operating assets.....	\$3,000,000	\$7,000,000	\$5,000,000
Net operating income	\$600,000	\$560,000	\$800,000
Minimum required rate of return.....	14%	10%	16%

Required:

1. Compute the return on investment (ROI) for each division using the formula stated in terms of margin and turnover.
2. Compute the residual income for each division.

3. Assume that each division is presented with an investment opportunity that would yield a 15% rate of return.
 - a. If performance is being measured by ROI, which division or divisions will probably accept the opportunity? Reject? Why?
 - b. If performance is being measured by residual income, which division or divisions will probably accept the opportunity? Reject? Why?



EXERCISE 10-9 Effects of Changes in Profits and Assets on Return on Investment (ROI) [LO2]

Pecs Alley is a regional chain of health clubs. The managers of the clubs, who have authority to make investments as needed, are evaluated based largely on return on investment (ROI). The Springfield Club reported the following results for the past year:

Sales	\$1,400,000
Net operating income	\$70,000
Average operating assets.....	\$350,000

Required:

The following questions are to be considered independently. Carry out all computations to two decimal places.

1. Compute the club's return on investment (ROI).
2. Assume that the manager of the club is able to increase sales by \$70,000 and that, as a result, net operating income increases by \$18,200. Further assume that this is possible without any increase in operating assets. What would be the club's return on investment (ROI)?
3. Assume that the manager of the club is able to reduce expenses by \$14,000 without any change in sales or operating assets. What would be the club's return on investment (ROI)?
4. Assume that the manager of the club is able to reduce operating assets by \$70,000 without any change in sales or net operating income. What would be the club's return on investment (ROI)?



EXERCISE 10-10 Effects of Changes in Sales, Expenses, and Assets on ROI [LO2]

CommercialServices.com Corporation provides business-to-business services on the Internet. Data concerning the most recent year appear below:

Sales	\$3,000,000
Net operating income	\$150,000
Average operating assets	\$750,000

Required:

Consider each question below independently. Carry out all computations to two decimal places.

1. Compute the company's return on investment (ROI).
2. The entrepreneur who founded the company is convinced that sales will increase next year by 50% and that net operating income will increase by 200%, with no increase in average operating assets. What would be the company's ROI?
3. The chief financial officer of the company believes a more realistic scenario would be a \$1,000,000 increase in sales, requiring a \$250,000 increase in average operating assets, with a resulting \$200,000 increase in net operating income. What would be the company's ROI in this scenario?



EXERCISE 10-11 Creating a Balanced Scorecard [LO4]

Ariel Tax Services prepares tax returns for individual and corporate clients. As the company has gradually expanded to 10 offices, the founder Max Jacobs has begun to feel as though he is losing control of operations. In response to this concern, he has decided to implement a performance measurement system that will help control current operations and facilitate his plans of expanding to 20 offices.

Jacobs describes the keys to the success of his business as follows:

Our only real asset is our people. We must keep our employees highly motivated and we must hire the 'cream of the crop.' Interestingly, employee morale and recruiting success are both driven by the same two factors—compensation and career advancement. In other words, providing

superior compensation relative to the industry average coupled with fast-track career advancement opportunities keeps morale high and makes us a very attractive place to work. It drives a high rate of job offer acceptances relative to job offers tendered.

Hiring highly qualified people and keeping them energized ensures operational success, which in our business is a function of productivity, efficiency, and effectiveness. Productivity boils down to employees being billable rather than idle. Efficiency relates to the time required to complete a tax return. Finally, effectiveness is critical to our business in the sense that we cannot tolerate errors. Completing a tax return quickly is meaningless if the return contains errors.

Our growth depends on acquiring new customers through word-of-mouth from satisfied repeat customers. We believe that our customers come back year after year because they value error-free, timely, and courteous tax return preparation. Common courtesy is an important aspect of our business! We call it service quality, and it all ties back to employee morale in the sense that happy employees treat their clients with care and concern.

While sales growth is obviously important to our future plans, growth without a corresponding increase in profitability is useless. Therefore, we understand that increasing our profit margin is a function of cost-efficiency as well as sales growth. Given that payroll is our biggest expense, we must maintain an optimal balance between staffing levels and the revenue being generated. As I alluded to earlier, the key to maintaining this balance is employee productivity. If we can achieve cost-efficient sales growth, we should eventually have 20 profitable offices!

Required:

1. Create a balanced scorecard for Ariel Tax Services. Link your scorecard measures using the framework from Exhibit 10-8. Indicate whether each measure is expected to increase or decrease. Feel free to create measures that may not be specifically mentioned in the chapter, but make sense given the strategic goals of the company.
2. What hypotheses are built into the balanced scorecard for Ariel Tax Services? Which of these hypotheses do you believe are most questionable and why?
3. Discuss the potential advantages and disadvantages of implementing an internal business process measure called *total dollar amount of tax refunds generated*. Would you recommend using this measure in Ariel's balanced scorecard?
4. Would it be beneficial to attempt to measure each office's individual performance with respect to the scorecard measures that you created? Why or why not?

EXERCISE 10-12 Return on Investment (ROI) and Residual Income Relations [LO2, LO3]

A family friend has asked your help in analyzing the operations of three anonymous companies operating in the same service sector industry. Supply the missing data in the table below:



	Company		
	A	B	C
Sales.....	\$9,000,000	\$7,000,000	\$4,500,000
Net operating income	\$?	\$ 280,000	\$?
Average operating assets	\$3,000,000	\$?	\$1,800,000
Return on investment (ROI)	18%	14%	?
Minimum required rate of return:			
Percentage	16%	?	15%
Dollar amount	\$?	\$ 320,000	\$?
Residual income	\$?	\$?	\$ 90,000

EXERCISE 10-13 Working with a Segmented Income Statement [LO1]

Raner, Harris, & Chan is a consulting firm that specializes in information systems for medical and dental clinics. The firm has two offices—one in Chicago and one in Minneapolis. The firm classifies the direct



costs of consulting jobs as variable costs. A contribution format segmented income statement for the company's most recent year is given below:

	Total Company		Office			
			Chicago		Minneapolis	
Sales	\$450,000	100%	\$150,000	100%	\$300,000	100%
Variable expenses	<u>225,000</u>	<u>50%</u>	<u>45,000</u>	<u>30%</u>	<u>180,000</u>	<u>60%</u>
Contribution margin	225,000	50%	105,000	70%	120,000	40%
Traceable fixed expenses	<u>126,000</u>	<u>28%</u>	<u>78,000</u>	<u>52%</u>	<u>48,000</u>	<u>16%</u>
Office segment margin	99,000	22%	<u>\$ 27,000</u>	<u>18%</u>	<u>\$ 72,000</u>	<u>24%</u>
Common fixed expenses not traceable to offices	<u>63,000</u>	<u>14%</u>				
Net operating income	<u>\$ 36,000</u>	<u>8%</u>				

Required:

- By how much would the company's net operating income increase if Minneapolis increased its sales by \$75,000 per year? Assume no change in cost behavior patterns.
- Refer to the original data. Assume that sales in Chicago increase by \$50,000 next year and that sales in Minneapolis remain unchanged. Assume no change in fixed costs.
 - Prepare a new segmented income statement for the company using the above format. Show both amounts and percentages.
 - Observe from the income statement you have prepared that the contribution margin ratio for Chicago has remained unchanged at 70% (the same as in the above data) but that the segment margin ratio has changed. How do you explain the change in the segment margin ratio?

EXERCISE 10-14 Working with a Segmented Income Statement [LO1]

Refer to the data in Exercise 10-13. Assume that Minneapolis' sales by major market are:

	Minneapolis		Market			
			Medical		Dental	
Sales	\$300,000	100%	\$200,000	100%	\$100,000	100%
Variable expenses	<u>180,000</u>	<u>60%</u>	<u>128,000</u>	<u>64%</u>	<u>52,000</u>	<u>52%</u>
Contribution margin	120,000	40%	72,000	36%	48,000	48%
Traceable fixed expenses	<u>33,000</u>	<u>11%</u>	<u>12,000</u>	<u>6%</u>	<u>21,000</u>	<u>21%</u>
Market segment margin	87,000	29%	<u>\$ 60,000</u>	<u>30%</u>	<u>\$ 27,000</u>	<u>27%</u>
Common fixed expenses not traceable to markets	<u>15,000</u>	<u>5%</u>				
Office segment margin	<u>\$ 72,000</u>	<u>24%</u>				



The company would like to initiate an intensive advertising campaign in one of the two market segments during the next month. The campaign would cost \$5,000. Marketing studies indicate that such a campaign would increase sales in the Medical market by \$40,000 or increase sales in the Dental market by \$35,000.

Required:

- In which of the markets would you recommend that the company focus its advertising campaign? Show computations to support your answer.
- In Exercise 10-13, Minneapolis shows \$48,000 in traceable fixed expenses. What happened to the \$48,000 in this exercise?



EXERCISE 10-15 Segmented Income Statement [LO1]

Wingate Company, a wholesale distributor of videotapes, has been experiencing losses for some time, as shown by its most recent monthly contribution format income statement, which follows:

Sales	\$1,000,000
Variable expenses	390,000
Contribution margin	610,000
Fixed expenses	625,000
Net operating income (loss).....	\$ (15,000)

In an effort to isolate the problem, the president has asked for an income statement segmented by division. Accordingly, the Accounting Department has developed the following information:

	Division		
	East	Central	West
Sales.....	\$250,000	\$400,000	\$350,000
Variable expenses as a percentage of sales.....	52%	30%	40%
Traceable fixed expenses	\$160,000	\$200,000	\$175,000

Required:

1. Prepare a contribution format income statement segmented by divisions, as desired by the president.
2. As a result of a marketing study, the president believes that sales in the West Division could be increased by 20% if monthly advertising in that division were increased by \$15,000. Would you recommend the increased advertising? Show computations to support your answer.

EXERCISE 10-16 Cost-Volume-Profit Analysis and Return on Investment (ROI) [LO2]

Posters.com is a small Internet retailer of high-quality posters. The company has \$1,000,000 in operating assets and fixed expenses of \$150,000 per year. With this level of operating assets and fixed expenses, the company can support sales of up to \$3,000,000 per year. The company's contribution margin ratio is 25%, which means that an additional dollar of sales results in additional contribution margin, and net operating income, of 25 cents.



Required:

1. Complete the following table showing the relation between sales and return on investment (ROI).

Sales	Net Operating Income	Average Operating Assets	ROI
\$2,500,000	\$475,000	\$1,000,000	?
\$2,600,000	\$?	\$1,000,000	?
\$2,700,000	\$?	\$1,000,000	?
\$2,800,000	\$?	\$1,000,000	?
\$2,900,000	\$?	\$1,000,000	?
\$3,000,000	\$?	\$1,000,000	?

2. What happens to the company's return on investment (ROI) as sales increase? Explain.

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PROBLEMS

Alternate problem set is available on the text website.

PROBLEM 10-17A Return on Investment (ROI) and Residual Income [LO2, LO3]

"I know headquarters wants us to add that new product line," said Dell Havasi, manager of Billings Company's Office Products Division. "But I want to see the numbers before I make any move. Our division's return on investment (ROI) has led the company for three years, and I don't want any letdown."

CHECK FIGURE

(1) ROI if new product is added: 19.2%



Billings Company is a decentralized wholesaler with five autonomous divisions. The divisions are evaluated on the basis of ROI, with year-end bonuses given to the divisional managers who have the highest ROIs. Operating results for the company's Office Products Division for the most recent year are given below:

Sales	\$10,000,000
Variable expenses	6,000,000
Contribution margin	4,000,000
Fixed expenses	3,200,000
Net operating income	\$ 800,000
Divisional operating assets	\$ 4,000,000

The company had an overall return on investment (ROI) of 15% last year (considering all divisions). The Office Products Division has an opportunity to add a new product line that would require an additional investment in operating assets of \$1,000,000. The cost and revenue characteristics of the new product line per year would be:

Sales	\$2,000,000
Variable expenses	60% of sales
Fixed expenses	\$640,000

Required:

1. Compute the Office Products Division's ROI for the most recent year; also compute the ROI as it would appear if the new product line is added.
2. If you were in Dell Havasi's position, would you accept or reject the new product line? Explain.
3. Why do you suppose headquarters is anxious for the Office Products Division to add the new product line?
4. Suppose that the company's minimum required rate of return on operating assets is 12% and that performance is evaluated using residual income.
 - a. Compute the Office Products Division's residual income for the most recent year; also compute the residual income as it would appear if the new product line is added.
 - b. Under these circumstances, if you were in Dell Havasi's position, would you accept or reject the new product line? Explain.

CHECK FIGURE

- (2) Company A
margin: 14%



PROBLEM 10-18A Comparison of Performance Using Return on Investment (ROI) [LO2]

Comparative data on three companies in the same service industry are given below:

	Company		
	A	B	C
Sales	\$600,000	\$500,000	\$?
Net operating income	\$ 84,000	\$ 70,000	\$?
Average operating assets.....	\$300,000	\$?	\$1,000,000
Margin.....	?	?	3.5%
Turnover	?	?	2
ROI	?	7%	?

Required:

1. What advantages are there to breaking down the ROI computation into two separate elements, margin and turnover?
2. Fill in the missing information above, and comment on the relative performance of the three companies in as much detail as the data permit. Make *specific recommendations* about how to improve the ROI.

(Adapted from National Association of Accountants,
Research Report No. 35, p. 34)

PROBLEM 10-19A Perverse Effects of Some Performance Measures [LO4]

There is often more than one way to improve a performance measure. Unfortunately, some of the actions taken by managers to make their performance look better may actually harm the organization. For example, suppose the marketing department is held responsible only for increasing the performance measure “total revenues.” Increases in total revenues may be achieved by working harder and smarter, but they can also usually be achieved by simply cutting prices. The increase in volume from cutting prices almost always results in greater total revenues; however, it does not always lead to greater total profits. Those who design performance measurement systems need to keep in mind that managers who are under pressure to perform may take actions to improve performance measures that have negative consequences elsewhere.

**Required:**

For each of the following situations, describe actions that managers might take to show improvement in the performance measure but which do not actually lead to improvement in the organization’s overall performance.

1. Concerned with the slow rate at which new products are brought to market, top management of a consumer electronics company introduces a new performance measure—speed-to-market. The research and development department is given responsibility for this performance measure, which measures the average amount of time a product is in development before it is released to the market for sale.
2. The CEO of a telephone company has been under public pressure from city officials to fix the large number of public pay phones that do not work. The company’s repair people complain that the problem is vandalism and damage caused by theft of coins from coin boxes—particularly in high-crime areas in the city. The CEO says she wants the problem solved and has pledged to city officials that there will be substantial improvement by the end of the year. To ensure that this is done, she makes the managers in charge of installing and maintaining pay phones responsible for increasing the percentage of public pay phones that are fully functional.
3. A manufacturing company has been plagued by the chronic failure to ship orders to customers by the promised date. To solve this problem, the production manager has been given the responsibility of increasing the percentage of orders shipped on time. When a customer calls in an order, the production manager and the customer agree to a delivery date. If the order is not completed by that date, it is counted as a late shipment.
4. Concerned with the productivity of employees, the board of directors of a large multinational corporation has dictated that the manager of each subsidiary will be held responsible for increasing the revenue per employee of his or her subsidiary.

PROBLEM 10-20A Return on Investment (ROI) and Residual Income [LO2, LO3]

Financial data for Joel de Paris, Inc., for last year follow:

CHECK FIGURE

(1) ROI: 25%

Joel de Paris, Inc.		
Balance Sheet		
	Beginning Balance	Ending Balance
Assets		
Cash.....	\$ 140,000	\$ 120,000
Accounts receivable.....	450,000	530,000
Inventory.....	320,000	380,000
Plant and equipment, net.....	680,000	620,000
Investment in Buisson, S.A.....	250,000	280,000
Land (undeveloped).....	180,000	170,000
Total assets.....	<u>\$2,020,000</u>	<u>\$2,100,000</u>
Liabilities and Stockholders' Equity		
Accounts payable.....	\$ 360,000	\$ 310,000
Long-term debt.....	1,500,000	1,500,000
Stockholders' equity.....	160,000	290,000
Total liabilities and stockholders' equity.....	<u>\$2,020,000</u>	<u>\$2,100,000</u>

Joel de Paris, Inc. Income Statement		
Sales.....		\$4,050,000
Operating expenses.....		<u>3,645,000</u>
Net operating income.....		405,000
Interest and taxes:		
Interest expense.....	\$150,000	
Tax expense.....	<u>110,000</u>	<u>260,000</u>
Net income.....		<u>\$ 145,000</u>

The company paid dividends of \$15,000 last year. The “Investment in Buisson, S.A.” on the balance sheet represents an investment in the stock of another company.

Required:

1. Compute the company’s margin, turnover, and return on investment (ROI) for last year.
2. The board of directors of Joel de Paris, Inc., has set a minimum required rate of return of 15%. What was the company’s residual income last year?

CHECK FIGURE

- (3) ROI: 19.6%;
(6) ROI: 16.3%

PROBLEM 10-21A Return on Investment (ROI) Analysis [LO2]

The contribution format income statement for Huerra Company for last year is given below:

	A	B	C	D
			Total	Unit
1				
2	Sales		\$4,000,000	\$80.00
3	Variable expenses		<u>2,800,000</u>	<u>56.00</u>
4	Contribution margin		1,200,000	24.00
5	Fixed expenses		<u>840,000</u>	<u>16.80</u>
6	Net operating income		360,000	7.20
7	Income taxes @	30%	<u>108,000</u>	<u>2.16</u>
8	Net operating income		<u>\$ 252,000</u>	<u>\$ 5.04</u>
9				

The company had average operating assets of \$2,000,000 during the year.

Required:

1. Compute the company’s return on investment (ROI) for the period using the ROI formula stated in terms of margin and turnover.

For each of the following questions, indicate whether the margin and turnover will increase, decrease, or remain unchanged as a result of the events described, and then compute the new ROI figure. Consider each question separately, starting in each case from the data used to compute the original ROI in (1) above.

2. Using Lean Production, the company is able to reduce the average level of inventory by \$400,000. (The released funds are used to pay off short-term creditors.)
3. The company achieves a cost savings of \$32,000 per year by using less costly materials.
4. The company issues bonds and uses the proceeds to purchase \$500,000 in machinery and equipment at the beginning of the period. Interest on the bonds is \$60,000 per year. Sales remain unchanged. The new, more efficient equipment reduces production costs by \$20,000 per year.
5. As a result of a more intense effort by salespeople, sales are increased by 20%; operating assets remain unchanged.

6. Obsolete inventory carried on the books at a cost of \$40,000 is scrapped and written off as a loss.
7. The company uses \$200,000 of cash (received on accounts receivable) to repurchase and retire some of its common stock.

PROBLEM 10-22A Building a Balanced Scorecard [LO4]

Lost Peak ski resort was for many years a small, family-owned resort serving day skiers from nearby towns. Lost Peak was recently acquired by Western Resorts, a major ski resort operator. The new owners have plans to upgrade the resort into a destination resort for vacationers. As part of this plan, the new owners would like to make major improvements in the Powder 8 Lodge, the resort's on-the-hill cafeteria. The menu at the lodge is very limited—hamburgers, hot dogs, chili, tuna fish sandwiches, pizzas, french fries, and packaged snacks. With little competition, the previous owners of the resort had felt no urgency to upgrade the food service at the lodge. If skiers want lunch on the mountain, the only alternatives are the Powder 8 Lodge or a brown bag lunch brought from home.

As part of the deal when acquiring Lost Peak, Western Resorts agreed to retain all of the current employees of the resort. The manager of the lodge, while hardworking and enthusiastic, has very little experience in the restaurant business. The manager is responsible for selecting the menu, finding and training employees, and overseeing daily operations. The kitchen staff prepare food and wash dishes. The dining room staff take orders, serve as cashiers, and clean the dining room area.

Shortly after taking over Lost Peak, management of Western Resorts held a day-long meeting with all of the employees of the Powder 8 Lodge to discuss the future of the ski resort and the new management's plans for the lodge. At the end of this meeting, management and lodge employees created a balanced scorecard for the lodge that would help guide operations for the coming ski season. Almost everyone who participated in the meeting seemed to be enthusiastic about the scorecard and management's plans for the lodge.

The following performance measures were included on the balanced scorecard for the Powder 8 Lodge:

- a. Weekly Powder 8 Lodge sales
- b. Weekly Powder 8 Lodge profit
- c. Number of menu items
- d. Dining area cleanliness as rated by a representative from Western Resorts management
- e. Customer satisfaction with menu choices as measured by customer surveys
- f. Customer satisfaction with service as measured by customer surveys
- g. Average time to take an order
- h. Average time to prepare an order
- i. Percentage of kitchen staff completing basic cooking course at the local community college
- j. Percentage of dining room staff completing basic hospitality course at the local community college (Western Resorts will pay for the costs of staff attending courses at the local community college.)

Required:

1. Using the above performance measures, construct a balanced scorecard for the Powder 8 Lodge. Use Exhibit 10-8 as a guide. Use arrows to show causal links and indicate with a + or - whether the performance measure should increase or decrease.
2. What hypotheses are built into the balanced scorecard for the Powder 8 Lodge? Which of these hypotheses do you believe are most questionable? Why?
3. How will management know if one of the hypotheses underlying the balanced scorecard is false?

PROBLEM 10-23A Segment Reporting and Decision Making [LO1]

Vulcan Company's contribution format income statement for June is given below:

Vulcan Company Income Statement For the Month Ended June 30	
Sales	\$750,000
Variable expenses	<u>336,000</u>
Contribution margin	414,000
Fixed expenses	<u>378,000</u>
Net operating income	<u>\$ 36,000</u>



CHECK FIGURE
(1) Northern segment margin: \$24,000

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Management is disappointed with the company's performance and is wondering what can be done to improve profits. By examining sales and cost records, you have determined the following:

- a. The company is divided into two sales territories—Northern and Southern. The Northern territory recorded \$300,000 in sales and \$156,000 in variable expenses during June; the remaining sales and variable expenses were recorded in the Southern territory. Fixed expenses of \$120,000 and \$108,000 are traceable to the Northern and Southern territories, respectively. The rest of the fixed expenses are common to the two territories.
- b. The company is the exclusive distributor for two products—Paks and Tibs. Sales of Paks and Tibs totaled \$50,000 and \$250,000, respectively, in the Northern territory during June. Variable expenses are 22% of the selling price for Paks and 58% for Tibs. Cost records show that \$30,000 of the Northern territory's fixed expenses are traceable to Paks and \$40,000 to Tibs, with the remainder common to the two products.

Required:

1. Prepare contribution format segmented income statements first showing the total company broken down between sales territories and then showing the Northern territory broken down by product line. In addition, for the company as a whole and for each segment, show each item on the segmented income statements as a percent of sales.
2. Look at the statement you have prepared showing the total company segmented by sales territory. What insights revealed by this statement should be brought to the attention of management?
3. Look at the statement you have prepared showing the Northern territory segmented by product lines. What insights revealed by this statement should be brought to the attention of management?

CHECK FIGURE

- (1) Cookbook segment margin: \$18,000



PROBLEM 10-24A Basic Segment Reporting; Activity-Based Cost Assignment [LO1]

Diversified Products, Inc., has recently acquired a small publishing company that Diversified Products intends to operate as one of its investment centers. The newly acquired company has three books that it offers for sale—a cookbook, a travel guide, and a handy speller. Each book sells for \$10. The publishing company's most recent monthly income statement is given below:

	Total Company	Product Line		
		Cookbook	Travel Guide	Handy Speller
Sales	\$300,000	\$90,000	\$150,000	\$60,000
Expenses:				
Printing costs	102,000	27,000	63,000	12,000
Advertising	36,000	13,500	19,500	3,000
General sales	18,000	5,400	9,000	3,600
Salaries	33,000	18,000	9,000	6,000
Equipment depreciation	9,000	3,000	3,000	3,000
Sales commissions	30,000	9,000	15,000	6,000
General administration	42,000	14,000	14,000	14,000
Warehouse rent	12,000	3,600	6,000	2,400
Depreciation—office facilities	3,000	1,000	1,000	1,000
Total expenses	285,000	94,500	139,500	51,000
Net operating income (loss)	\$ 15,000	\$ (4,500)	\$ 10,500	\$ 9,000

The following additional information is available about the company:

- a. Only printing costs and sales commissions are variable; all other costs are fixed. The printing costs (which include materials, labor, and variable overhead) are traceable to the three product lines as shown in the statement above. Sales commissions are 10% of sales for any product.
- b. The same equipment is used to produce all three books, so the equipment depreciation cost has been allocated equally among the three product lines. An analysis of the company's activities indicates that the equipment is used 30% of the time to produce cookbooks, 50% of the time to produce travel guides, and 20% of the time to produce handy spellers.
- c. The warehouse is used to store finished units of product, so the rental cost has been allocated to the product lines on the basis of sales dollars. The warehouse rental cost is \$3 per square foot per year. The warehouse contains 48,000 square feet of space, of which 7,200 square feet is used by the cookbook line, 24,000 square feet by the travel guide line, and 16,800 square feet by the handy speller line.

- d. The general sales cost on the prior page includes the salary of the sales manager and other sales costs not traceable to any specific product line. This cost has been allocated to the product lines on the basis of sales dollars.
- e. The general administration cost and depreciation of office facilities both relate to administration of the company as a whole. These costs have been allocated equally to the three product lines.
- f. All other costs are traceable to the three product lines in the amounts shown on the statement on the prior page.

The management of Diversified Products, Inc., is anxious to improve the new investment center's 5% return on sales.

Required:

1. Prepare a new contribution format segmented income statement for the month. Adjust allocations of equipment depreciation and of warehouse rent as indicated by the additional information provided.
2. After seeing the income statement in the main body of the problem, management has decided to eliminate the cookbook because it is not returning a profit, and to focus all available resources on promoting the travel guide.
 - a. Based on the statement you have prepared, do you agree with the decision to eliminate the cookbook? Explain.
 - b. Based on the statement you have prepared, do you agree with the decision to focus all available resources on promoting the travel guide? Assume that an ample market is available for all three product lines. (*Hint:* Compute the contribution margin ratio for each product.)

PROBLEM 10–25A Creating Balanced Scorecards That Support Different Strategies [LO4]

The Midwest Consulting Group (MCG) helps companies build balanced scorecards. As part of its marketing efforts, MCG conducts an annual balanced scorecard workshop for prospective clients. As MCG's newest employee, your boss has asked you to participate in this year's workshop by explaining to attendees how a company's strategy determines the measures that are appropriate for its balanced scorecard. Your boss has provided you with the excerpts below from the annual reports of two current MCG clients. She has asked you to use these excerpts in your portion of the workshop.



Excerpt from Applied Pharmaceuticals' annual report:

The keys to our business are consistent and timely new product introductions and manufacturing process integrity. The new product introduction side of the equation is a function of research and development (R&D) yield (e.g., the number of marketable drug compounds created relative to the total number of potential compounds pursued). We seek to optimize our R&D yield and first-to-market capability by investing in state-of-the-art technology, hiring the highest possible percentage of the "best and the brightest" engineers that we pursue, and providing world-class training to those engineers. Manufacturing process integrity is all about establishing world-class quality specifications and then relentlessly engaging in prevention and appraisal activities to minimize defect rates. Our customers must have an awareness of and respect for our brand image of being "first to market and first in quality." If we deliver on this pledge to our customers, then our financial goal of increasing our return on stockholders' equity should take care of itself.

Excerpt from Destination Resorts International's annual report:

Our business succeeds or fails based on the quality of the service that our front-line employees provide to customers. Therefore, it is imperative that we strive to maintain high employee morale and minimize employee turnover. In addition, it is critical that we train our employees to use technology to create one seamless worldwide experience for our repeat customers. Once an employee enters a customer preference (e.g., provide two extra pillows in the room, deliver fresh brewed coffee to the room at 8:00 A.M., etc.) into our database, our worldwide workforce strives to ensure that a customer will never need to repeat it at any of our destination resorts. If we properly train and retain a motivated workforce, we should see continuous improvement in our percentage of error-free repeat customer check-ins, the time taken to resolve customer complaints, and our independently assessed room cleanliness. This in turn should drive improvement in our customer retention, which is the key to meeting our revenue growth goals.

Required:

1. Based on the excerpts above, compare and contrast the strategies of Applied Pharmaceuticals and Destination Resorts International.
2. Select balanced scorecard measures for each company and link the scorecard measures using the framework from Exhibit 10–8. Use arrows to show the causal links between the performance measures and show whether the performance measure should increase or decrease over time. Feel free to create measures that may not be specifically mentioned in the chapter, but nonetheless make sense given the strategic goals of each company.

3. What hypotheses are built into each balanced scorecard? Why do the hypotheses differ between the two companies?

CHECK FIGURE

- (3) West segment margin:
\$31,500

**PROBLEM 10-26A Restructuring a Segmented Income Statement [LO1]**

Losses have been incurred at Millard Corporation for some time. In an effort to isolate the problem and improve the company's performance, management has requested that the monthly income statement be segmented by sales region. The company's first effort at preparing a segmented statement is given below. This statement is for May, the most recent month of activity.

	Sales Region		
	West	Central	East
Sales.....	\$450,000	\$800,000	\$ 750,000
Regional expenses (traceable):			
Cost of goods sold	162,900	280,000	376,500
Advertising	108,000	200,000	210,000
Salaries	90,000	88,000	135,000
Utilities	13,500	12,000	15,000
Depreciation.....	27,000	28,000	30,000
Shipping expense	17,100	32,000	28,500
Total regional expenses	418,500	640,000	795,000
Regional income (loss) before corporate expenses	31,500	160,000	(45,000)
Corporate expenses:			
Advertising (general).....	18,000	32,000	30,000
General administrative expense	50,000	50,000	50,000
Total corporate expenses	68,000	82,000	80,000
Net operating income (loss).....	<u>\$ (36,500)</u>	<u>\$ 78,000</u>	<u>\$(125,000)</u>

Cost of goods sold and shipping expense are both variable; other costs are all fixed.

Millard Corporation is a wholesale distributor of office products. It purchases office products from manufacturers and distributes them in the three regions given above. The three regions are about the same size, and each has its own manager and sales staff. The products that the company distributes vary widely in profitability.

Required:

- List any disadvantages or weaknesses that you see to the statement format illustrated above.
- Explain the basis that is apparently being used to allocate the corporate expenses to the regions. Do you agree with these allocations? Explain.
- Prepare a new contribution format segmented income statement for May. Show a Total column as well as data for each region. In addition, for the company as a whole and for each sales region, show each item on the segmented income statement as a percent of sales.
- Analyze the statement that you prepared in part (3) above. What points that might help to improve the company's performance would you bring to management's attention?

BUILDING YOUR SKILLS**COMMUNICATING IN PRACTICE [LO2, LO3]**

How do the performance measurement and compensation systems of service companies compare with those of manufacturers? Ask the manager of your local McDonald's, Wendy's, Burger King, or other fast-food chain if he or she could spend some time discussing the performance measures that the company uses to evaluate store managers and how the performance measures tie in with their compensation.

Required:

After asking the following questions, write a brief memorandum to your instructor that summarizes what you discovered during your interview with the manager of the franchise.

1. What are the national chain's goals, that is, the broad, long-range plans of the company (e.g., to increase market share)?
2. What performance measures are used to help motivate the store managers and monitor progress toward achieving the corporation's goals?
3. Are the performance measures consistent with the store manager's compensation plan?

CASE [LO4]

Haglund Department Store is located in the downtown area of a small city. While the store had been profitable for many years, it is facing increasing competition from large national chains that have set up stores on the outskirts of the city. Recently the downtown area has been undergoing revitalization, and the owners of Haglund Department Store are somewhat optimistic that profitability can be restored.

In an attempt to accelerate the return to profitability, management of Haglund Department Store is in the process of designing a balanced scorecard for the company. Management believes the company should focus on two key problems. First, customers are taking longer and longer to pay the bills they incur using the department store's charge card, and the company has far more bad debts than are normal for the industry. If this problem were solved, the company would have more cash to make much needed renovations. Investigation has revealed that much of the problem with late payments and unpaid bills results from customers disputing incorrect charges on their bills. These incorrect charges usually occur because salesclerks incorrectly enter data on the charge account slip. Second, the company has been incurring large losses on unsold seasonal apparel. Such items are ordinarily resold at a loss to discount stores that specialize in such distress items.

The meeting in which the balanced scorecard approach was discussed was disorganized and ineffectively led—possibly because no one other than one of the vice presidents had read anything about how to build a balanced scorecard. Nevertheless, a number of potential performance measures were suggested by various managers. These potential performance measures are:

- a. Percentage of charge account bills containing errors.
- b. Percentage of salesclerks trained to correctly enter data on charge account slips.
- c. Average age of accounts receivables.
- d. Profit per employee.
- e. Customer satisfaction with accuracy of charge account bills from monthly customer survey.
- f. Total sales revenue.
- g. Sales per employee.
- h. Travel expenses for buyers for trips to fashion shows.
- i. Unsold inventory at the end of the season as a percentage of total cost of sales.
- j. Courtesy shown by junior staff members to senior staff members based on surveys of senior staff.
- k. Percentage of suppliers making just-in-time deliveries.
- l. Sales per square foot of floor space.
- m. Written-off accounts receivable (bad debts) as a percentage of sales.
- n. Quality of food in the staff cafeteria based on staff surveys.
- o. Percentage of employees who have attended the city's cultural diversity workshop.
- p. Total profit.

Required:

1. As someone with more knowledge of the balanced scorecard than almost anyone else in the company, you have been asked to build an integrated balanced scorecard. In your scorecard, use only performance measures listed previously. You do not have to use all of the performance measures suggested by the managers, but you should build a balanced scorecard that reveals a strategy for dealing with the problems with accounts receivable and with unsold merchandise. Construct the balanced scorecard following the format used in Exhibit 10-8. Do not be concerned with whether a specific performance measure falls within the learning and growth, internal business process, customer, or financial perspective. However, use arrows to show the causal links between performance measures within your balanced scorecard and explain whether the performance measures should show increases or decreases.
2. Assume that the company adopts your balanced scorecard. After operating for a year, some performance measures show improvements, but not others. What should management do next?
3.
 - a. Suppose that customers express greater satisfaction with the accuracy of their charge account bills but the performance measures for the average age of accounts receivable and for bad debts do not improve. Explain why this might happen.
 - b. Suppose that the performance measures for the average age of accounts receivable, bad debts, and unsold inventory improve, but total profits do not. Explain why this might happen. Assume in your answer that the explanation lies within the company.





RESEARCH AND APPLICATION

[LO1, LO2, LO3]

The questions in this exercise are based on FedEx Corporation. To answer the questions you will need to download FedEx's Form 10-K for the fiscal year ended May 31, 2005 at www.sec.gov/edgar/searchedgar/companysearch.html. Once at this website, input CIK code 1048911 and hit enter. In the gray box on the right-hand side of your computer screen define the scope of your search by inputting 10-K and then pressing enter. Select the 10-K with a filing date of July 14, 2005. You do not need to print this document to answer the questions.

Required:

1. What is FedEx's strategy for success in the marketplace? Does the company rely primarily on a customer intimacy, operational excellence, or product leadership customer value proposition? What evidence supports your conclusion?
2. What are FedEx's four main business segments? Provide two examples of traceable fixed costs for each of FedEx's four business segments. Provide two examples of common costs that are not traceable to the four business segments.
3. Identify one example of a cost center, a profit center, and an investment center for FedEx.
4. Provide three examples of fixed costs that can be traceable or common depending on how FedEx defines its business segments.
5. Compute the margin, turnover, and return on investment (ROI) in 2005 for each of FedEx's four business segments. (Hint: page 99 reports total segment assets for each business segment).
6. Assume that FedEx established a minimum required rate of return of 15% for each of its business segments. Compute the residual income earned in 2005 in each of FedEx's four segments.
7. Assume that the senior managers of FedEx Express and FedEx Ground each have an investment opportunity that would require \$20 million of additional operating assets and that would increase operating income by \$4 million. If FedEx evaluates all of its senior managers using ROI, would the managers of both segments pursue the investment opportunity? If FedEx evaluates all of its senior managers using residual income, would the managers of both segments pursue the investment opportunity?

11

Relevant Costs for Decision Making

<< A LOOK BACK

We concluded our coverage of performance measures in Chapter 10 by focusing on decentralized organizations. Return on investment (ROI) and residual income are used to motivate the managers of investment centers and to monitor the performance of these centers.

A LOOK AT THIS CHAPTER

We continue our coverage of decision making in Chapter 11 by focusing on the use of relevant cost data when analyzing alternatives. In general, only those costs and benefits that differ between alternatives are relevant in a decision. This basic idea is applied in a wide variety of situations in this chapter.

A LOOK AHEAD >>

Common approaches to making major investment decisions, which can have significant long-term implications for any organization, are discussed in Chapter 12.

CHAPTER OUTLINE

Cost Concepts for Decision Making

- Identifying Relevant Costs and Benefits
- Different Costs for Different Purposes
- An Example of Identifying Relevant Costs and Benefits
- Reconciling the Total and Differential Approaches
- Why Isolate Relevant Costs?

Adding and Dropping Product Lines and Other Segments

- An Illustration of Cost Analysis
- A Comparative Format
- Beware of Allocated Fixed Costs

The Make or Buy Decision

- An Example of Make or Buy

Opportunity Cost

Special Orders

Utilization of a Constrained Resource

- Contribution Margin per Unit of the Constrained Resource
- Managing Constraints



LEARNING OBJECTIVES



After studying Chapter 11, you should be able to:

- LO1** Identify relevant and irrelevant costs and benefits in a decision.
- LO2** Prepare an analysis showing whether a product line or other business segment should be dropped or retained.
- LO3** Prepare a make or buy analysis.
- LO4** Prepare an analysis showing whether a special order should be accepted.
- LO5** Determine the most profitable use of a constrained resource and the value of obtaining more of the constrained resource.

Massaging the Numbers

Building and expanding convention centers appears to be an obsession with politicians. Indeed, in 44 cities across the United States, billions of dollars are being spent to build or expand convention centers—adding more than 7 million square feet of convention space to the 64 million square feet that already exists. Given that trade show attendance across the country has been steadily declining, how do politicians justify these enormous investments? Politicians frequently rely on consultants who produce studies that purport to show the convention center will have a favorable economic impact on the area.

These economic impact studies are bogus in two respects. First, a large portion of the so-called favorable economic impact that is cited by consultants would be realized by a city even if it did not invest in a new or expanded convention center. For example, Portland, Oregon, voters overwhelmingly opposed spending \$82 million to expand their city's convention center. Nonetheless, local politicians proceeded with the project. After completing the expansion, more than 70% of the people spending money at trade shows in Portland were from the Portland area. How much of the money spent by these locals would have been spent in Portland anyway if the convention center had not been expanded? We don't know, but in all likelihood much of this money would have been spent anyway at the zoo, the art museum, the theater, local restaurants, and so on. This portion of the "favorable" economic impact cited by consultants and used by politicians to justify expanding convention centers should be ignored because of its irrelevance. Second, since the supply of convention centers throughout the United States substantially exceeds demand, convention centers must offer substantial economic incentives, such as waiving rental fees, to attract trade shows. The cost of these concessions, although often excluded from consultants' projections, further erodes the genuine economic viability of building or expanding a convention center.

Source: Victoria Murphy, "The Answer Is Always Yes," *Forbes*, February, 28, 2005, pp. 82–84.

Managers must decide what products to sell, whether to make or buy component parts, what prices to charge, what channels of distribution to use, whether to accept special orders at special prices, and so forth. Making such decisions is often a difficult task that is complicated by numerous alternatives and massive amounts of data, only some of which may be relevant.

Every decision involves choosing from among at least two alternatives. In making a decision, the costs and benefits of one alternative must be compared to the costs and benefits of other alternatives. Costs that differ between alternatives are called **relevant costs**. Distinguishing between relevant and irrelevant costs and benefits is critical for two reasons. First, irrelevant data can be ignored—saving decision makers tremendous amounts of time and effort. Second, bad decisions can easily result from erroneously including irrelevant costs and benefits when analyzing alternatives. To be successful in decision making, managers must be able to tell the difference between relevant and irrelevant data and must be able to correctly use the relevant data in analyzing alternatives. The purpose of this chapter is to develop these skills by illustrating their use in a wide range of decision-making situations. These decision-making skills are as important in your personal life as they are to managers. After completing your study of this chapter, you should be able to think more clearly about decisions in many facets of your life.

COST CONCEPTS FOR DECISION MAKING

LEARNING OBJECTIVE 1

Identify relevant and irrelevant costs and benefits in a decision.

Four cost terms discussed in Chapter 1 are particularly applicable to this chapter. These terms are *differential costs*, *incremental costs*, *opportunity costs*, and *sunk costs*. You may find it helpful to turn back to Chapter 1 and refresh your memory concerning these terms before reading on.



Identifying Relevant Costs and Benefits

Only those costs and benefits that differ in total between alternatives are relevant in a decision. If the total amount of a cost will be the same regardless of the alternative selected, then the decision has no effect on the cost, so the cost can be ignored. For example, if you are trying to decide whether to go to a movie or rent a DVD for the evening, the rent on your apartment is irrelevant. Whether you go to a movie or rent a DVD, the rent on your apartment will be exactly the same and is therefore irrelevant to the decision. On the other hand, the cost of the movie ticket and the cost of renting the DVD would be relevant in the decision because they are *avoidable costs*.

An **avoidable cost** is a cost that can be eliminated in whole or in part by choosing one alternative over another. By choosing the alternative of going to the movie, the cost of renting the DVD can be avoided. By choosing the alternative of renting the DVD, the cost of the movie ticket can be avoided. Therefore, the cost of the movie ticket and the cost of renting the DVD are both avoidable costs. On the other hand, the rent on your apartment is not an avoidable cost of either alternative. You would continue to rent your apartment under either alternative. Avoidable costs are relevant costs. Unavoidable costs are irrelevant costs.

Two broad categories of costs are never relevant in decisions. These irrelevant costs are:

1. Sunk costs.
2. Future costs that do not differ between the alternatives.

As we learned in an earlier chapter, a **sunk cost** is a cost that has already been incurred and cannot be avoided regardless of what a manager decides to do. For example, suppose a used car dealer purchased a five-year-old Toyota Camry for \$12,000. The amount paid for the Camry is a sunk cost because it has already been incurred and the transaction cannot be undone. Sunk costs are always the same no matter what alternatives are being

considered; therefore, they are irrelevant and should be ignored when making decisions. Future costs that do not differ between alternatives should also be ignored when making decisions. Continuing with the example discussed earlier, suppose you intend to order a pizza after you go to the movie theater or you rent a DVD. In that case, if you are going to buy the same pizza regardless of your choice of entertainment, its cost is irrelevant to the choice of whether you go to the movie theater or rent a DVD. Notice, the cost of the pizza is not a sunk cost because it has not yet been incurred. Nonetheless, the cost of the pizza is irrelevant to the entertainment decision because it is a future cost that does not differ between the alternatives.

The term **differential cost** was also introduced in Chapter 1. In managerial accounting, the terms *avoidable cost*, *differential cost*, *incremental cost*, and *relevant cost* are often used interchangeably. To identify the costs that are avoidable in a particular decision situation and are therefore relevant, these steps should be followed:

1. Eliminate costs and benefits that do not differ between alternatives. These irrelevant costs consist of (a) sunk costs and (b) future costs that do not differ between alternatives.
2. Use the remaining costs and benefits that do differ between alternatives in making the decision. The costs that remain are the differential, or avoidable, costs.

The Relevant Cost of Executive Perks

IN BUSINESS

The **Securities and Exchange Commission** is concerned about CEOs who use company-owned airplanes for personal travel. For example, consider a CEO who uses his employers' Gulfstream V luxury airplane to transport his family on a 2,000 mile roundtrip vacation from New York City to Orlando, Florida. The standard practice among companies with personal travel reimbursement policies would be to charge their CEO \$1,500 for this flight based on a per-mile reimbursement rate established by the **Internal Revenue Service** (the IRS rates are meant to approximate the per-mile cost of a first-class ticket on a commercial airline). However, critics argue that using IRS reimbursement rates grossly understates the flight costs that are borne by shareholders. Some of these critics claim that the \$11,000 incremental cost of the flight, including fuel, landing fees, and crew hotel charges, should be reimbursed by the CEO. Still others argue that even basing reimbursements on incremental costs understates the true cost of a flight because fixed costs such as the cost of the airplane, crew salaries, and insurance should be included. These costs are relevant because the excessive amount of personal travel by corporate executives essentially requires their employers to purchase, insure, and staff additional airplanes. This latter group of critics argues that the relevant cost of the trip from New York City to Orlando is \$43,000—the market price that would have to be paid to charter a comparable size airplane for this flight. What is the relevant cost of this flight? Should shareholders expect their CEO to reimburse \$0 (as is the practice at some companies), \$1,500, \$11,000, or \$43,000? Or, should all companies disallow personal use of corporate assets?

Source: Mark Maremont, "Amid Crackdown, the Jet Perk Suddenly Looks a Lot Pricier," *The Wall Street Journal*, May 25, 2005, pp. A1 and A8.

Different Costs for Different Purposes

We need to recognize a fundamental concept of managerial accounting from the outset of our discussion—costs that are relevant in one decision situation are not necessarily relevant in another. This means that *managers need different costs for different purposes*. For one purpose, a particular group of costs may be relevant; for another purpose, an entirely different group of costs may be relevant. Thus, *each* decision situation must be carefully analyzed to isolate the relevant costs. Otherwise, irrelevant data may cloud the situation and lead to a bad decision.

The concept of “different costs for different purposes” is basic to managerial accounting; we shall frequently see its application in the pages that follow.

An Example of Identifying Relevant Costs and Benefits

Cynthia is currently a student in an MBA program in Boston and would like to visit a friend in New York City over the weekend. She is trying to decide whether to drive or take the train. Because she is on a tight budget, she wants to carefully consider the costs of the two alternatives. If one alternative is far less expensive than the other, that may be decisive in her choice. By car, the distance between her apartment in Boston and her friend’s apartment in New York City is 230 miles. Cynthia has compiled the following list of items to consider:

Automobile Costs		
Item	Annual Cost of Fixed Items	Cost per Mile (based on 10,000 miles per year)
(a) Annual straight-line depreciation on car [((\$24,000 original cost – \$10,000 estimated resale value in 5 years)/5 years)	\$2,800	\$0.280
(b) Cost of gasoline (\$2.70 per gallon ÷ 27 miles per gallon)		0.100
(c) Annual cost of auto insurance and license	\$1,380	0.138
(d) Maintenance and repairs		0.065
(e) Parking fees at school (\$45 per month × 8 months).....	\$360	0.036
(f) Total average cost per mile.....		<u>\$0.619</u>
Additional Data		
Item		
(g) Reduction in the resale value of car due solely to wear and tear		\$0.026 per mile
(h) Cost of round-trip Amtrak ticket from Boston to New York City	\$104	
(i) Benefit of relaxing and being able to study during the train ride rather than having to drive		?
(j) Cost of putting the dog in a kennel while gone	\$40	
(k) Benefit of having a car available in New York City		?
(l) Hassle of parking the car in New York City		?
(m) Cost of parking the car in New York City.....		\$25 per day

Which costs and benefits are relevant in this decision? Remember, only those costs and benefits that differ between alternatives are relevant. Everything else is irrelevant and can be ignored.

Start at the top of the list with item (a): the original cost of the car is a sunk cost. This cost has already been incurred and therefore can never differ between alternatives. Consequently, it is irrelevant and should be ignored. The same is true of the accounting depreciation of \$2,800 per year, which simply spreads the sunk cost across five years.

Item (b), the cost of gasoline consumed by driving to New York City, is a relevant cost. If Cynthia takes the train, this cost would not be incurred. Hence, the cost differs between alternatives and is therefore relevant.

Item (c), the annual cost of auto insurance and license, is not relevant. Whether Cynthia takes the train or drives on this particular trip, her annual auto insurance premium and her auto license fee will remain the same.¹

Item (d), the cost of maintenance and repairs, is relevant. While maintenance and repair costs have a large random component, over the long run they should be more or less proportional to the number of miles the car is driven. Thus, the average cost of \$0.065 per mile is a reasonable estimate to use.

Item (e), the monthly fee that Cynthia pays to park at her school during the academic year is not relevant. Regardless of which alternative she selects—driving or taking the train—she will still need to pay for parking at school.

Item (f) is the total average cost of \$0.619 per mile. As discussed above, some elements of this total are relevant, but some are not relevant. Because it contains some irrelevant costs, it would be incorrect to estimate the cost of driving to New York City and back by simply multiplying the \$0.619 by 460 miles (230 miles each way \times 2). This erroneous approach would yield a cost of driving of \$284.74. Unfortunately, such mistakes are often made in both personal life and in business. Because the total cost is stated on a per-mile basis, people are easily misled. Often people think that if the cost is stated as \$0.619 per mile, the cost of driving 100 miles is \$61.90. But it is not. Many of the costs included in the \$0.619 cost per mile are sunk and/or fixed and will not increase if the car is driven another 100 miles. The \$0.619 is an average cost, not an incremental cost. Beware of such unitized costs (i.e., costs stated in terms of a dollar amount per unit, per mile, per direct labor-hour, per machine-hour, and so on)—they are often misleading.

Item (g), the decline in the resale value of the car that occurs as a consequence of driving more miles, is relevant in the decision. Because she uses the car, its resale value declines, which is a real cost of using the car that should be taken into account. Cynthia estimated this cost by accessing the *Kelly Blue Book* website at www.kbb.com. The reduction in resale value of an asset through use or over time is often called *real* or *economic depreciation*. This is different from accounting depreciation, which attempts to match the sunk cost of an asset with the periods that benefit from that cost.

Item (h), the \$104 cost of a round-trip ticket on Amtrak, is relevant in this decision. If she drives, she would not have to buy the ticket.

Item (i) is relevant to the decision, even if it is difficult to put a dollar value on relaxing and being able to study while on the train. It is relevant because it is a benefit that is available under one alternative but not under the other.

Item (j), the cost of putting Cynthia's dog in the kennel while she is gone, is irrelevant in this decision. Whether she takes the train or drives to New York City, she will still need to put her dog in a kennel.

Like item (i), items (k) and (l) are relevant to the decision even if it is difficult to measure their dollar impacts.

Item (m), the cost of parking in New York City, is relevant to the decision.

Bringing together all of the relevant data, Cynthia would estimate the relevant costs of driving and taking the train as follows:

Relevant financial cost of driving to New York City:	
Gasoline (460 miles \times \$0.100 per mile)	\$ 46.00
Maintenance and repairs (460 miles \times \$0.065 per mile)	29.90
Reduction in the resale value of car due solely to wear and tear (460 miles \times \$0.026 per mile).....	11.96
Cost of parking the car in New York City (2 days \times \$25 per day).....	50.00
Total	<u>\$137.86</u>
Relevant financial cost of taking the train to New York City:	
Cost of round-trip Amtrak ticket from Boston to New York City.....	<u>\$104.00</u>

¹If Cynthia has an accident while driving to New York City or back, this might affect her insurance premium when the policy is renewed. The increase in the insurance premium would be a relevant cost of this particular trip, but the normal amount of the insurance premium is not relevant in any case.

What should Cynthia do? From a purely financial standpoint, it would be cheaper by \$33.86 ($\$137.86 - \104.00) to take the train than to drive. Cynthia has to decide if the convenience of having a car in New York City outweighs the additional cost and the disadvantages of being unable to relax and study on the train and the hassle of finding parking in the city.

In this example, we focused on identifying the relevant costs and benefits—everything else was ignored. In the next example, we include all of the costs and benefits—relevant or not. Nonetheless, we'll still get the correct answer because the irrelevant costs and benefits will cancel out when we compare the alternatives.

IN BUSINESS



Dell Stumbles Due to Poor Customer Service

Dell Inc. decided to cut customer service costs by shifting most of its call centers overseas and staffing them with temporary workers who were rewarded for minimizing the length of customer calls. The unintended consequences of Dell's choices were predictable—the number of angry repeat callers skyrocketed and the company's customer satisfaction and "likely to repurchase" survey scores plummeted.

Fearful that unhappy customers would take their business elsewhere, Dell spent \$150 million to hire thousands of full-time call center employees in North America. The company also began rewarding these employees based on how well they solved callers' problems. These changes paid off as Dell began receiving two million fewer customer service calls per quarter. Customer satisfaction and "likely to repurchase" scores rose substantially.

Dell's experience highlights the danger of overemphasizing cost cutting while overlooking the revenues that may be lost due to customer dissatisfaction.

Source: David Kirkpatrick, "Dell in the Penalty Box," *Fortune*, September 18, 2006, pp. 70–78.

Reconciling the Total and Differential Approaches

Oak Harbor Woodworks is considering a new labor-saving machine that rents for \$3,000 per year. The machine will be used on the company's butcher block production line. Data concerning the company's annual sales and costs of butcher blocks with and without the new machine are shown below:

	Current Situation	Situation with the New Machine
Units produced and sold	5,000	5,000
Selling price per unit	\$40	\$40
Direct materials cost per unit	\$14	\$14
Direct labor cost per unit	\$8	\$5
Variable overhead cost per unit	\$2	\$2
Fixed costs, other.....	\$62,000	\$62,000
Fixed costs, rental of new machine.....	—	\$3,000

Given the data above, the net operating income for the product under the two alternatives can be computed as shown in Exhibit 11-1.

EXHIBIT 11-1

Total and Differential Costs

	Current Situation	Situation with New Machine	Differential Costs and Benefits
Sales (5,000 units × \$40 per unit)	\$200,000	\$200,000	\$ 0
Variable expenses:			
Direct materials (5,000 units × \$14 per unit)	70,000	70,000	0
Direct labor (5,000 units × \$8 per unit; 5,000 units × \$5 per unit)	40,000	25,000	15,000
Variable overhead (5,000 units × \$2 per unit)	10,000	10,000	0
Total variable expenses	120,000	105,000	
Contribution margin	80,000	95,000	
Fixed expenses:			
Other	62,000	62,000	0
Rent of new machine	0	3,000	(3,000)
Total fixed expenses	62,000	65,000	
Net operating income	<u>\$ 18,000</u>	<u>\$ 30,000</u>	<u>\$12,000</u>

Note that the net operating income is \$12,000 higher with the new machine, so that is the better alternative. Note also that the \$12,000 advantage for the new machine can be obtained in two different ways. It is the difference between the \$30,000 net operating income with the new machine and the \$18,000 net operating income for the current situation. It is also the sum of the differential costs and benefits as shown in the last column of Exhibit 11-1. A positive number in the Differential Costs and Benefits column indicates that the difference between the alternatives favors the new machine; a negative number indicates that the difference favors the current situation. A zero in that column simply means that the total amount for the item is exactly the same for both alternatives. Thus, because the difference in the net operating incomes equals the sum of the differences for the individual items, any cost or benefit that is the same for both alternatives will have no impact on which alternative is preferred. This is the reason that costs and benefits that do not differ between alternatives are irrelevant and can be ignored. If we properly account for them, they will cancel out when we compare the alternatives.

We could have arrived at the same solution much more quickly by completely ignoring the irrelevant costs and benefits.

- The selling price per unit and the number of units sold do not differ between the alternatives. Therefore, the total sales revenues are exactly the same for the two alternatives as shown in Exhibit 11-1. Because the sales revenues are exactly the same, they have no effect on the difference in net operating income between the two alternatives. That is shown in the last column in Exhibit 11-1, which shows a \$0 differential benefit.
- The direct materials cost per unit, the variable overhead cost per unit, and the number of units produced and sold do not differ between the alternatives. Consequently, the total direct materials cost and the total variable overhead cost are the same for the two alternatives and can be ignored.
- The “other” fixed expenses do not differ between the alternatives, so they can be ignored as well.

Indeed, the only costs that do differ between the alternatives are direct labor costs and the fixed rental cost of the new machine. Hence, the two alternatives can be compared based only on these relevant costs:

Net Advantage of Renting the New Machine	
Decrease in direct labor costs (5,000 units at a cost savings of \$3 per unit)	\$15,000
Increase in fixed expenses	(3,000)
Net annual cost savings from renting the new machine	<u>\$12,000</u>

If we focus on just the relevant costs and benefits, we get exactly the same answer as when we listed all of the costs and benefits—including those that do not differ between the alternatives and hence are irrelevant. We get the same answer because the only costs and benefits that matter in the final comparison of the net operating incomes are those that differ between the two alternatives and hence are not zero in the last column of Exhibit 11-1. Those two relevant costs are both listed in the above analysis showing the net advantage of renting the new machine.

Why Isolate Relevant Costs?

In the preceding example, we used two different approaches to analyze the alternatives. First, we considered all costs, both those that were relevant and those that were not; and second, we considered only the relevant costs. We obtained the same answer under both approaches. It would be natural to ask, “Why bother to isolate relevant costs when total costs will do the job just as well?” Isolating relevant costs is desirable for at least two reasons.

First, only rarely will enough information be available to prepare a detailed income statement for both alternatives. Assume, for example, that you are called on to make a decision relating to a portion of a single business process in a multidepartmental, multi-product company. Under these circumstances, it would be virtually impossible to prepare an income statement of any type. You would have to rely on your ability to recognize which costs are relevant and which are not in order to assemble the data necessary to make a decision.

Second, mingling irrelevant costs with relevant costs may cause confusion and distract attention from the information that is really critical. Furthermore, the danger always exists that an irrelevant piece of data may be used improperly, resulting in an incorrect decision. The best approach is to ignore irrelevant data and base the decision entirely on relevant data.

Relevant cost analysis, combined with the contribution approach to the income statement, provides a powerful tool for making decisions. We will investigate various uses of this tool in the remaining sections of this chapter.

IN BUSINESS

Environmental Costs Add Up

A decision analysis can be flawed by incorrectly including irrelevant costs such as sunk costs and future costs that do not differ between alternatives. It can also be flawed by omitting future costs that do differ between alternatives. This is a problem particularly with environmental costs because they have dramatically increased in recent years and are often overlooked by managers.

Consider the environmental complications posed by a decision of whether to install a solvent-based or powder-based system for spray-painting parts. In a solvent painting system, parts are sprayed as they move along a conveyor. The paint that misses the part is swept away by a wall of

(continued)

water, called a water curtain. The excess paint accumulates in a pit as sludge that must be removed each month. Environmental regulations classify this sludge as hazardous waste. As a result, a permit must be obtained to produce the waste and meticulous records must be maintained of how the waste is transported, stored, and disposed of. The annual costs of complying with these regulations can easily exceed \$140,000 in total for a painting facility that initially costs only \$400,000 to build. The costs of complying with environmental regulations include the following:

- The waste sludge must be hauled to a special disposal site. The typical disposal fee is about \$300 per barrel, or \$55,000 per year for a modest solvent-based painting system.
- Workers must be specially trained to handle the paint sludge.
- The company must carry special insurance.
- The company must pay substantial fees to the state for releasing pollutants (i.e., the solvent) into the air.
- The water in the water curtain must be specially treated to remove contaminants. This can cost tens of thousands of dollars per year.

In contrast, a powder-based painting system avoids almost all of these environmental costs. Excess powder used in the painting process can be recovered and reused without creating hazardous waste. Additionally, the powder-based system does not release contaminants into the atmosphere. Therefore, even though the cost of building a powder-based system may be higher than the cost of building a solvent-based system, over the long run the costs of the powder-based system may be far lower due to the high environmental costs of a solvent-based system. Managers need to be aware of such environmental costs and take them fully into account when making decisions.

Source: Germain Böer, Margaret Curtin, and Louis Hoyt, "Environmental Cost Management," *Management Accounting*, volume 80, issue 3, pp. 28–38.

1. Which of the following statements is false? (You may select more than one answer.)
 - a. Under some circumstances, a sunk cost may be a relevant cost.
 - b. Future costs that do not differ between alternatives are irrelevant.
 - c. The same cost may be relevant or irrelevant depending on the decision context.
 - d. Only variable costs are relevant costs. Fixed costs cannot be relevant costs.
2. Assume that in October you bought a \$450 nonrefundable airline ticket to Telluride, Colorado, for a 5-day/4-night winter ski vacation. You now have an opportunity to buy an airline ticket for a 5-day/4-night winter ski vacation in Stowe, Vermont, for \$400 that includes a free ski lift ticket. The price of your lift ticket for the Telluride vacation would be \$300. The price of a hotel room in Telluride is \$180 per night. The price of a hotel room in Stowe is \$150 per night. Which of the following costs is not relevant in a decision of whether to proceed with the planned trip to Telluride or to change to a trip to Stowe?
 - a. The \$450 airline ticket to Telluride.
 - b. The \$400 airline ticket to Stowe.
 - c. The \$300 lift ticket for the Telluride vacation.
 - d. The \$180 per night hotel room in Telluride.
3. Based on the facts in question 2 above, does a differential cost analysis favor Telluride or Stowe, and by how much?
 - a. Stowe by \$470.
 - b. Stowe by \$20.
 - c. Telluride by \$70.
 - d. Telluride by \$20.



**CONCEPT
CHECK**

ADDING AND DROPPING PRODUCT LINES AND OTHER SEGMENTS

LEARNING OBJECTIVE 2

Prepare an analysis showing whether a product line or other business segment should be dropped or retained.

Decisions relating to whether product lines or other segments of a company should be dropped and new ones added are among the most difficult that a manager has to make. In such decisions, many qualitative and quantitative factors must be considered. Ultimately, however, any final decision to drop or retain a business segment is going to hinge primarily on the impact the decision will have on net operating income. To assess this impact, costs must be carefully analyzed.



An Illustration of Cost Analysis

Exhibit 11-2 provides sales and cost information for the preceding month for the Discount Drug Company and its three major product lines—drugs, cosmetics, and housewares. A quick review of this exhibit suggests that dropping the housewares segment would increase the company's overall net operating income by \$8,000. However, this would be a flawed conclusion because the data in Exhibit 11-2 do not distinguish between fixed expenses that can be avoided if a product line is dropped and common fixed expenses that cannot be avoided by dropping any particular product line.

In this scenario, the two alternatives under consideration are keeping the housewares product line and dropping the housewares product line. Therefore, only those costs that differ between these two alternatives (i.e., that can be avoided by dropping the housewares product line) are relevant. In deciding whether to drop housewares, it is crucial to identify which costs can be avoided, and hence are relevant to the decision, and which costs cannot be avoided, and hence are irrelevant. The decision should be analyzed as follows.

If the housewares line is dropped, then the company will lose \$20,000 per month in contribution margin, but by dropping the line it may be possible to avoid some fixed costs such as salaries or advertising costs. If dropping the housewares line enables the company to avoid more in fixed costs than it loses in contribution margin, then its overall net operating income will improve by eliminating the product line. On the other hand, if the company is not able to avoid as much in fixed costs as it loses in contribution margin, then the housewares line should be kept. In short, the manager should ask, "What costs can I avoid if I drop this product line?"

As we have seen from our earlier discussion, not all costs are avoidable. For example, some of the costs associated with a product line may be sunk costs. Other costs

EXHIBIT 11-2
Discount Drug Company
Product Lines

	Product Line			
	Total	Drugs	Cosmetics	Housewares
Sales	\$250,000	\$125,000	\$75,000	\$50,000
Variable expenses	105,000	50,000	25,000	30,000
Contribution margin	145,000	75,000	50,000	20,000
Fixed expenses:				
Salaries	50,000	29,500	12,500	8,000
Advertising.....	15,000	1,000	7,500	6,500
Utilities.....	2,000	500	500	1,000
Depreciation—fixtures	5,000	1,000	2,000	2,000
Rent.....	20,000	10,000	6,000	4,000
Insurance.....	3,000	2,000	500	500
General administrative	30,000	15,000	9,000	6,000
Total fixed expenses.....	125,000	59,000	38,000	28,000
Net operating income (loss).....	\$ 20,000	\$ 16,000	\$12,000	\$ (8,000)

may be allocated fixed costs that will not differ in total regardless of whether the product line is dropped or retained.

To show how to proceed in a product-line analysis, suppose that Discount Drug Company has analyzed the fixed costs being charged to the three product lines and has determined the following:

1. The salaries expense represents salaries paid to employees working directly on the product. All of the employees working in housewares would be discharged if the product line is dropped.
2. The advertising expense represents advertisements that are specific to each product line and are avoidable if the line is dropped.
3. The utilities expense represents utilities costs for the entire company. The amount charged to each product line is an allocation based on space occupied and is not avoidable if the product line is dropped.
4. The depreciation expense represents depreciation on fixtures used to display the various product lines. Although the fixtures are nearly new, they are custom-built and will have no resale value if the housewares line is dropped.
5. The rent expense represents rent on the entire building housing the company; it is allocated to the product lines on the basis of sales dollars. The monthly rent of \$20,000 is fixed under a long-term lease agreement.
6. The insurance expense is for insurance carried on inventories within each of the three product lines. If housewares is dropped, the related inventories will be liquidated and the insurance premiums will decrease accordingly.
7. The general administrative expense represents the costs of accounting, purchasing, and general management, which are allocated to the product lines on the basis of sales dollars. These costs will not change if the housewares line is dropped.

With this information, management can determine that \$15,000 of the fixed expenses associated with the housewares product line are avoidable and \$13,000 are not:

Fixed Expenses	Total Cost Assigned to Housewares	Not Avoidable*	Avoidable
Salaries	\$ 8,000		\$ 8,000
Advertising	6,500		6,500
Utilities	1,000	\$ 1,000	
Depreciation—fixtures.....	2,000	2,000	
Rent	4,000	4,000	
Insurance	500		500
General administrative.....	6,000	6,000	
Total.....	<u>\$28,000</u>	<u>\$13,000</u>	<u>\$15,000</u>

*These fixed costs represent either sunk costs or future costs that will not change whether the housewares line is retained or discontinued.

As stated earlier, if the housewares product line were dropped, the company would lose the product’s contribution margin of \$20,000, but would save its associated avoidable fixed expenses. We now know that those avoidable fixed expenses total \$15,000. Therefore, dropping the housewares product line would result in a \$5,000 *reduction* in net operating income as shown below:

Contribution margin lost if the housewares line is discontinued (see Exhibit 11–2)	\$(20,000)
Less fixed costs that can be avoided if the housewares line is discontinued (see above)	<u>15,000</u>
Decrease in overall company net operating income	<u>\$ (5,000)</u>

EXHIBIT 11-3
A Comparative Format for
Product-Line Analysis

	Keep Housewares	Drop Housewares	Difference: Net Operating Income Increase (or Decrease)
Sales.....	\$50,000	\$ 0	\$(50,000)
Variable expenses.....	<u>30,000</u>	<u>0</u>	<u>30,000</u>
Contribution margin.....	20,000	0	(20,000)
Fixed expenses:			
Salaries.....	8,000	0	8,000
Advertising.....	6,500	0	6,500
Utilities.....	1,000	1,000	0
Depreciation—fixtures.....	2,000	2,000	0
Rent.....	4,000	4,000	0
Insurance.....	500	0	500
General administrative.....	<u>6,000</u>	<u>6,000</u>	<u>0</u>
Total fixed expenses.....	<u>28,000</u>	<u>13,000</u>	<u>15,000</u>
Net operating income (loss).....	<u><u>\$ (8,000)</u></u>	<u><u>\$(13,000)</u></u>	<u><u>\$ (5,000)</u></u>

In this case, the fixed costs that can be avoided by dropping the housewares product line (\$15,000) are less than the contribution margin that will be lost (\$20,000). Therefore, based on the data given, the housewares line should not be discontinued unless a more profitable use can be found for the floor and counter space that it is occupying.

A Comparative Format

This decision can also be approached by preparing comparative income statements showing the effects of either keeping or dropping the product line. Exhibit 11-3 contains such an analysis for the Discount Drug Company. As shown in the last column of the exhibit, if the housewares line is dropped, then overall company net operating income will decrease by \$5,000 each period. This is the same answer, of course, as we obtained when we focused just on the lost contribution margin and avoidable fixed costs.

Beware of Allocated Fixed Costs

Go back to Exhibit 11-2. Does this exhibit suggest that the housewares product line should be kept—as we have just concluded? No, it does not. Exhibit 11-2 suggests that the housewares product line is losing money. Why keep a product line that is showing a loss? The explanation for this apparent inconsistency lies in part with the common fixed costs that are being allocated to the product lines. As we observed in Chapter 10, one of the great dangers in allocating common fixed costs is that such allocations can make a product line (or other segment of a business) look less profitable than it really is. In this instance, allocating the common fixed costs among all product lines makes the housewares product line appear to be unprofitable. However, as we have shown above, dropping the product line would result in a decrease in the company's overall net operating income. This point can be seen clearly if we redo Exhibit 11-2 by eliminating the allocation of the common fixed costs. Exhibit 11-4 uses the segmented approach from Chapter 10 to estimate the profitability of the product lines.

Exhibit 11-4 gives us a much different perspective of the housewares line than does Exhibit 11-2. As shown in Exhibit 11-4, the housewares line is covering all of its own traceable fixed costs and generating a \$3,000 segment margin toward covering

EXHIBIT 11-4

Discount Drug Company Product Lines—Recast in Contribution Format (from Exhibit 11-2)

	Product Line			
	Total	Drugs	Cosmetics	Housewares
Sales	\$250,000	\$125,000	\$75,000	\$50,000
Variable expenses	<u>105,000</u>	<u>50,000</u>	<u>25,000</u>	<u>30,000</u>
Contribution margin.....	<u>145,000</u>	<u>75,000</u>	<u>50,000</u>	<u>20,000</u>
Traceable fixed expenses:				
Salaries	50,000	29,500	12,500	8,000
Advertising.....	15,000	1,000	7,500	6,500
Depreciation—fixtures	5,000	1,000	2,000	2,000
Insurance.....	<u>3,000</u>	<u>2,000</u>	<u>500</u>	<u>500</u>
Total traceable fixed expenses	<u>73,000</u>	<u>33,500</u>	<u>22,500</u>	<u>17,000</u>
Product-line segment margin	<u>72,000</u>	<u>\$ 41,500</u>	<u>\$27,500</u>	<u>\$ 3,000*</u>
Common fixed expenses:				
Utilities.....	2,000			
Rent.....	20,000			
General administrative	<u>30,000</u>			
Total common fixed expenses	<u>52,000</u>			
Net operating income.....	<u>\$ 20,000</u>			

*If the housewares line is dropped, this \$3,000 in segment margin will be lost to the company. In addition, we have seen that the \$2,000 depreciation on the fixtures is a sunk cost that cannot be avoided. The sum of these two figures (\$3,000 + \$2,000 = \$5,000) would be the decrease in the company's overall profits if the housewares line were discontinued. Of course, the company may later choose to drop the product if circumstances change—such as a pending decision to replace the fixtures.

the common fixed costs of the company. Unless another product line can be found that will generate a segment margin greater than \$3,000, the company would be better off keeping the housewares line. By keeping the product line, the company's overall net operating income will be higher than if the product line were dropped.

Additionally, managers may choose to retain an unprofitable product line if the line helps sell other products or if it serves as a “magnet” to attract customers. Bread, for example, may not be an especially profitable line in some food stores, but customers expect it to be available, and many of them would undoubtedly shift their buying elsewhere if a particular store decided to stop carrying it.

THE MAKE OR BUY DECISION

Providing a product or service to a customer involves many steps. For example, consider all of the steps that are necessary to develop and sell a product such as tax preparation software in retail stores. First the software must be developed, which involves highly skilled software engineers and a great deal of project management effort. Then the product must be put into a form that can be delivered to customers. This involves burning the application onto a blank CD or DVD, applying a label, and packaging the result in an attractive box. Then the product must be distributed to retail stores. Then the product must be sold. And finally, help lines and other forms of after-sale service may have to be provided. And we should not forget that the blank CD or DVD, the label, and the box must of course be made by someone before any of this can happen. All of these activities, from development, to production, to after-sales service are called a *value chain*.

LEARNING OBJECTIVE 3

Prepare a make or buy analysis.



Separate companies may carry out each of the activities in the value chain or a single company may carry out several. When a company is involved in more than one activity in the entire value chain, it is **vertically integrated**. Vertical integration is very common. Some companies control all of the activities in the value chain from producing basic raw materials right up to the final distribution of finished goods and provision of after-sales service. Other companies are content to integrate on a smaller scale by purchasing many of the parts and materials that go into their finished products. A decision to carry out one of the activities in the value chain internally, rather than to buy externally from a supplier, is called a **make or buy decision**. Quite often these decisions involve whether to buy a particular part or to make it internally. Make or buy decisions also involve decisions concerning whether to outsource development tasks, after-sales service, or other activities.

IN BUSINESS

Cessna Outsources Airplane Construction to China

Cessna Aircraft Company hired China's state-owned **Shenyang Aircraft Corporation** to produce its new 162 SkyCatcher aircraft. While **Boeing** and **Airbus** have used Chinese manufacturers for component parts, Cessna is the first company to turn over the complete production of an airplane to a Chinese company. Cessna hopes that buying the planes from a Chinese partner will provide cost savings that enable it to sell the plane for \$71,000 less than if the plane were made at its plant in Wichita, Kansas. Cessna expects to sell the first 1,000 SkyCatchers for \$109,500, whereas the company's least expensive model manufactured in Wichita sells for \$219,500. What are some of the risks that accompany Cessna's decision to outsource production to China?

Source: J. Lynn Lunsford, "Cessna's New Plane to Be Built in China," *The Wall Street Journal*, November 28, 2007, p. A14.

An Example of Make or Buy

To provide an illustration of a make or buy decision, consider Mountain Goat Cycles. The company is now producing the heavy-duty gear shifters used in its most popular line of mountain bikes. The company's Accounting Department reports the following costs of producing 8,000 units of the shifter internally each year:

	Per Unit	8,000 Units
Direct materials	\$ 6	\$ 48,000
Direct labor	4	32,000
Variable overhead	1	8,000
Supervisor's salary	3	24,000
Depreciation of special equipment	2	16,000
Allocated general overhead	5	40,000
Total cost	<u>\$21</u>	<u>\$168,000</u>

An outside supplier has offered to sell 8,000 shifters a year to Mountain Goat Cycles at a price of only \$19 each. Should the company stop producing the shifters internally and buy them from the outside supplier? As always, the focus should be on the relevant costs—those that differ between the alternatives. And the costs that differ between the alternatives consist of the costs that could be avoided by purchasing the shifters from the outside supplier. If the costs that can be avoided by purchasing the shifters from the outside supplier total less than \$19, then the company should continue to manufacture its own shifters and reject the outside supplier's offer. On the other hand, if the costs that can

EXHIBIT 11-5
Mountain Goat Cycles Make
or Buy Analysis

	Total Relevant Costs—8,000 units	
	Make	Buy
Direct materials (8,000 units × \$6 per unit)	\$ 48,000	
Direct labor (8,000 units × \$4 per unit)	32,000	
Variable overhead (8,000 units × \$1 per unit)	8,000	
Supervisor's salary	24,000	
Depreciation of special equipment (not relevant)		
Allocated general overhead (not relevant)		
Outside purchase price		\$152,000
Total cost	<u>\$112,000</u>	<u>\$152,000</u>
Difference in favor of continuing to make		<u>\$40,000</u>

be avoided by purchasing the shifters from the outside supplier total more than \$19, the outside supplier's offer should be accepted.

Note that depreciation of special equipment is listed as one of the costs of producing the shifters internally. Because the equipment has already been purchased, this depreciation is a sunk cost and is therefore irrelevant. If the equipment could be sold, its salvage value would be relevant. Or if the machine could be used to make other products, this could be relevant as well. However, we will assume that the equipment has no salvage value and that it has no other use except making the heavy-duty gear shifters.

Also note that the company is allocating a portion of its general overhead costs to the shifters. Any portion of this general overhead cost that would actually be eliminated if the gear shifters were purchased rather than made would be relevant in the analysis. However, it is likely that the general overhead costs allocated to the gear shifters are in fact common to all items produced in the factory and would continue unchanged even if the shifters were purchased from the outside. Such allocated common costs are not relevant costs (because they do not differ between the make or buy alternatives) and should be eliminated from the analysis along with the sunk costs.

The variable costs of producing the shifters can be avoided by buying the shifters from the outside supplier so they are relevant costs. We will assume in this case that the variable costs include direct materials, direct labor, and variable overhead. The supervisor's salary is also relevant if it could be avoided by buying the shifters. Exhibit 11-5 contains the relevant cost analysis of the make or buy decision assuming that the supervisor's salary can indeed be avoided.

Because it costs \$40,000 less to make the shifters internally than to buy them from the outside supplier, Mountain Goat Cycles should reject the outside supplier's offer. However, the company may wish to consider one additional factor before coming to a final decision—the opportunity cost of the space now being used to produce the shifters.

Outsourcing R&D

IN BUSINESS

A few years ago many experts felt that U.S. companies were unlikely to outsource their research and development (R&D) activities to lower labor cost Asian countries. However, these experts were wrong. Companies such as **Procter & Gamble**, **Boeing**, **Dell**, **Eli Lilly**, and **Motorola** are increasingly relying on Asian business partners to meet their R&D needs. In fact, research shows that U.S. technology companies outsource 70% of their personal digital assistant (PDA) designs, 65% of their notebook personal computer designs, and 30% of their digital camera designs.

(continued)

Allen J. Delattre, head of **Accenture**'s high-tech consulting practice, says "R&D is the single remaining controllable expense to work on. Companies either will have to cut costs or increase R&D productivity." In light of this stark reality, many companies are creating a global model of innovation that leverages the skills of Indian software developers, Taiwanese engineers, and Chinese factories. The lower labor rates available in these countries coupled with their strong technology orientation makes "buying" R&D capability from overseas more attractive to U.S. companies than relying solely on their domestic workforce to "make" R&D breakthroughs.

Source: Pete Engardio and Bruce Einhorn, "Outsourcing Innovation," *BusinessWeek*, March 21, 2005, pp. 82–94.

OPPORTUNITY COST

If the space now being used to produce the shifters *would otherwise be idle*, then Mountain Goat Cycles should continue to produce its own shifters and the supplier's offer should be rejected, as stated above. Idle space that has no alternative use has an opportunity cost of zero.

But what if the space now being used to produce shifters could be used for some other purpose? In that case, the space would have an opportunity cost equal to the segment margin that could be derived from the best alternative use of the space.

To illustrate, assume that the space now being used to produce shifters could be used to produce a new cross-country bike that would generate a segment margin of \$60,000 per year. Under these conditions, Mountain Goat Cycles should accept the supplier's offer and use the available space to produce the new product line:

	Make	Buy
Total annual cost (see Exhibit 11–5)	\$112,000	\$152,000
Opportunity cost—segment margin forgone on a potential new product line	60,000	
Total cost.....	<u>\$172,000</u>	<u>\$152,000</u>
Difference in favor of purchasing from the outside supplier.....		<u>\$20,000</u>

Opportunity costs are not recorded in the organization's general ledger because they do not represent actual dollar outlays. Rather, they represent economic benefits that are *forgone* as a result of pursuing some course of action. The opportunity cost for Mountain Goat Cycles is sufficiently large in this case to change the decision.

Tough Choices



Brad and Carole Karafil own and operate **White Grizzly Adventures**, a snowcat skiing and snowboarding company in Meadow Creek, British Columbia. While rare, it does sometimes happen that the company is unable to operate due to bad weather. Guests are housed and fed, but no one can ski. The contract signed by each guest stipulates that no refund is given in the case of an unavoidable cancellation that is beyond the control of the operators. So technically, Brad and Carole are not obligated to provide any refund if they must cancel operations due to

(continued)

bad weather. However, 70% of their guests are repeat customers and a guest who has paid roughly \$300 a day to ski is likely to be unhappy if skiing is cancelled even though it is no fault of White Grizzly.

What costs, if any, are saved if skiing is cancelled and the snowcat does not operate? Not much. Guests are still housed and fed and the guides, who are independent contractors, are still paid. Some snowcat operating costs are avoided, but little else. Therefore, there would be little cost savings to pass on to guests.

Brad and Carole could issue a credit to be used for one day of skiing at another time. If a customer with such a credit occupied a seat on a snowcat that would otherwise be empty, the only significant cost to Brad and Carole would be the cost of feeding the customer. However, an empty seat basically doesn't exist—the demand for seats far exceeds the supply and the schedule is generally fully booked far in advance of the ski season. Consequently, the real cost of issuing a credit for one day of skiing is high. Brad and Carole would be giving up \$300 from a paying customer for every guest they issue a credit voucher to. Issuing a credit voucher involves an opportunity cost of \$300 in forgone sales revenues.

What would you do if you had to cancel skiing due to bad weather? Would you issue a refund or a credit voucher, losing money in the process, or would you risk losing customers? It's a tough choice.

Source: Brad and Carole Karafil, owners and operators of White Grizzly Adventures, www.whitegrizzly.com.



Vice President of Production

DECISION MAKER

You are faced with a make or buy decision. The company currently makes a component for one of its products but is considering whether it should instead purchase the component. If the offer from an outside supplier were accepted, the company would no longer need to rent the machinery currently being used to manufacture the component. You realize that the annual rental cost is a fixed cost, but recall some sort of warning about fixed costs. Is the annual rental cost relevant to this make or buy decision?

SPECIAL ORDERS

LEARNING OBJECTIVE 4

Prepare an analysis showing whether a special order should be accepted.

Managers must often evaluate whether a *special order* should be accepted, and if the order is accepted, the price that should be charged. A **special order** is a one-time order that is not considered part of the company's normal ongoing business. To illustrate, Mountain Goat Cycles has just received a request from the Seattle Police Department to produce 100 specially modified mountain bikes at a price of \$558 each. The bikes would be used to patrol some of the more densely populated residential sections of the city. Mountain Goat Cycles can easily modify its City Cruiser model to fit the specifications of the Seattle Police. The normal selling price of the City Cruiser bike is \$698, and its unit product cost is \$564 as shown below:

Direct materials	\$372
Direct labor	90
Manufacturing overhead.....	102
Unit product cost	<u>\$564</u>



The variable portion of the above manufacturing overhead is \$12 per unit. The order would have no effect on the company's total fixed manufacturing overhead costs.

The modifications requested by the Seattle Police Department consist of welded brackets to hold radios, nightsticks, and other gear. These modifications would require \$34 in incremental variable costs. In addition, the company would have to pay a graphics design studio \$2,400 to design and cut stencils that would be used for spray painting the Seattle Police Department's logo and other identifying marks on the bikes.

This order should have no effect on the company's other sales. The production manager says that she can handle the special order without disrupting any of the company's regular scheduled production.

What effect would accepting this order have on the company's net operating income?

Only the incremental costs and benefits are relevant. Because the existing fixed manufacturing overhead costs would not be affected by the order, they are not relevant. The incremental net operating income can be computed as follows:

	Per Unit	Total 100 Bikes
Incremental revenue	\$558	\$55,800
Less incremental costs:		
Variable costs:		
Direct materials	372	37,200
Direct labor	90	9,000
Variable manufacturing overhead	12	1,200
Special modifications	34	3,400
Total variable cost	<u>\$508</u>	50,800
Fixed cost:		
Purchase of stencils		2,400
Total incremental cost		<u>53,200</u>
Incremental net operating income		<u>\$ 2,600</u>

Therefore, even though the \$558 price on the special order is below the normal \$564 unit product cost and the order would require additional costs, the order would increase net operating income. In general, a special order is profitable if the incremental revenue from the special order exceeds the incremental costs of the order. However, it is important to make sure that there is indeed idle capacity and that the special order does not cut into normal unit sales or undercut prices on normal sales. For example, if the company was operating at capacity, opportunity costs would have to be taken into account as well as the incremental costs that have already been detailed above.

UTILIZATION OF A CONSTRAINED RESOURCE

LEARNING OBJECTIVE 5

Determine the most profitable use of a constrained resource and the value of obtaining more of the constrained resource.



Managers routinely face the problem of deciding how constrained resources are going to be used. A department store, for example, has a limited amount of floor space and therefore cannot stock every product that may be available. A manufacturer has a limited number of machine-hours and a limited number of direct labor-hours at its disposal. When a limited resource of some type restricts the company's ability to satisfy demand, the company has a **constraint**. Because the company cannot fully satisfy demand, managers must decide which products or services should be cut back. In other words, managers must decide which products or services make the best use of the constrained resource. Fixed costs are usually unaffected by such choices, so the course of action that will maximize the company's total contribution margin should ordinarily be selected.

Contribution Margin per Unit of the Constrained Resource

If some products must be cut back because of a constraint, the key to maximizing the total contribution margin may seem obvious—favor the products with the highest unit contribution margins. Unfortunately, that is not quite correct. Rather, the correct solution is to favor the products that provide the highest *contribution margin per unit of the constrained resource*. To illustrate, in addition to its other products, Mountain Goat Cycles makes saddlebags for bicycles called *panniers*. These panniers come in two models—a touring model and a mountain model. Cost and revenue data for the two models of panniers follow:

	Mountain Pannier	Touring Pannier
Selling price per unit	\$25	\$30
Variable cost per unit	10	18
Contribution margin per unit	<u>\$15</u>	<u>\$12</u>
Contribution margin (CM) ratio.....	60%	40%

The mountain pannier appears to be much more profitable than the touring pannier. It has a \$15 per unit contribution margin as compared to only \$12 per unit for the touring model, and it has a 60% CM ratio as compared to only 40% for the touring model.

But now let us add one more piece of information—the plant that makes the panniers is operating at capacity. This does not mean that every machine and every person in the plant is working at the maximum possible rate. Because machines have different capacities, some machines will be operating at less than 100% of capacity. However, if the plant as a whole cannot produce any more units, some machine or process must be operating at capacity. The machine or process that is limiting overall output is called the **bottleneck**—it is the constraint.

At Mountain Goat Cycles, the bottleneck (i.e., constraint) is a stitching machine. The mountain pannier requires two minutes of stitching time per unit, and the touring pannier requires one minute of stitching time per unit. By definition, because the stitching machine is a bottleneck, the stitching machine does not have enough capacity to satisfy the existing demand for mountain panniers and touring panniers. Therefore, some orders for the products will have to be turned down. Naturally, managers will want to know which product is less profitable. To answer this question, they should focus on the contribution margin per unit of the constrained resource. This figure is computed by dividing a product's contribution margin per unit by the amount of the constrained resource required to make a unit of that product. These calculations are carried out below for the mountain and touring panniers:

	Mountain Pannier	Touring Pannier
Contribution margin per unit (a).....	\$15.00	\$12.00
Stitching machine time required to produce one unit (b)	2 minutes	1 minute
Contribution margin per unit of the constrained resource, (a) ÷ (b)	\$7.50 per minute	\$12.00 per minute

It is now easy to decide which product is less profitable and should be deemphasized. Each minute on the stitching machine that is devoted to the touring pannier results in an increase of \$12.00 in contribution margin and profits. The comparable figure for the mountain pannier is only \$7.50 per minute. Therefore, the touring model should be emphasized. Even though the mountain model has the larger contribution margin per unit

and the larger CM ratio, the touring model provides the larger contribution margin in relation to the constrained resource.

To verify that the touring model is indeed the more profitable product, suppose an hour of additional stitching time is available and that unfilled orders exist for both products. The additional hour on the stitching machine could be used to make either 30 mountain panniers (60 minutes \div 2 minutes per mountain pannier) or 60 touring panniers (60 minutes \div 1 minute per touring pannier), with the following profit implications:

	Mountain Pannier	Touring Pannier
Contribution margin per unit	\$ 15	\$ 12
Additional units that can be processed in one hour	<u>$\times 30$</u>	<u>$\times 60$</u>
Additional contribution margin.....	<u>\$450</u>	<u>\$720</u>

Because the additional contribution margin would be \$720 for the touring panniers and only \$450 for the mountain panniers, the touring panniers make the most profitable use of the company's constrained resource—the stitching machine.

This example clearly shows that looking at unit contribution margins alone is not enough; the contribution margin must be viewed in relation to the amount of the constrained resource each product requires.

IN BUSINESS

Theory of Constraints Software

Indalex Aluminum Solutions Group is the largest producer of soft alloy extrusions in North America. The company has installed a new generation of business intelligence software created by **pVelocity, Inc.**, of Toronto, Canada. The software "provides decision makers across our entire manufacturing enterprise with time-based financial metrics using TOC concepts to identify bottlenecks." And, it "shifts the focus of a manufacturing company from traditional cost accounting measurements to measuring the generation of dollars per unit of time." Instead of emphasizing products with the largest gross margins or contribution margins, the software helps managers to identify and emphasize the products that maximize the contribution margin per unit of the constrained resource.

Source: Mike Alger, "Managing a Business as a Portfolio of Customers," *Strategic Finance*, June 2003, pp. 54–57.

Managing Constraints

Effectively managing an organization's constraints is a key to increased profits. Effective management of a bottleneck constraint involves selecting the most profitable product mix and finding ways to increase the capacity of the bottleneck operation. As discussed above, if the constraint is a bottleneck in the production process, the most profitable product mix consists of the products with the highest contribution margin per unit of the constrained resource. In addition, as discussed below, increasing the capacity of the bottleneck operation should lead to increased production and sales. Such efforts will often pay off in an almost immediate increase in profits.

It is often possible for a manager to increase the capacity of the bottleneck, which is called **relaxing (or elevating) the constraint**. For example, the stitching machine operator could be asked to work overtime. This would result in more available stitching time and hence the production of more finished goods that can be sold. The benefits from

relaxing the constraint are often enormous and can be easily quantified. The manager should first ask, “What would I do with additional capacity at the bottleneck if it were available?” In our example, if unfilled orders exist for both the touring and mountain panniers, the additional capacity would be used to process more touring panniers because they earn a contribution margin of \$12 per minute, or \$720 per hour. Given that the overtime pay for the operator is likely to be much less than \$720 per hour, running the stitching machine on overtime would be an excellent way to increase the company’s profits while at the same time satisfying more customers.

To reinforce this concept, suppose that there are only unfilled orders for the mountain pannier. How much would it be worth to the company to run the stitching machine overtime in this situation? Because the additional capacity would be used to make the mountain pannier, the value of that additional capacity would drop to \$7.50 per minute or \$450 per hour. Nevertheless, the value of relaxing the constraint would still be quite high.

These calculations indicate that managers should pay great attention to the bottleneck operation. If a bottleneck machine breaks down or is ineffectively utilized, the losses to the company can be quite large. In our example, for every minute the stitching machine is down due to breakdowns or setups, the company loses between \$7.50 and \$12.00.² The losses on an hourly basis are between \$450 and \$720! In contrast, there is no such loss of contribution margin if time is lost on a machine that is not a bottleneck—such machines have excess capacity anyway.

The implications are clear. Managers should focus much of their attention on managing the bottleneck. As we have discussed, managers should emphasize products that most profitably utilize the constrained resource. They should also make sure that products are processed smoothly through the bottleneck, with minimal lost time due to breakdowns and setups. And they should try to find ways to increase the capacity at the bottleneck.

The capacity of a bottleneck can be effectively increased in a number of ways, including:

- Working overtime on the bottleneck.
- Subcontracting some of the processing that would be done at the bottleneck.
- Investing in additional machines at the bottleneck.
- Shifting workers from processes that are not bottlenecks to the process that is the bottleneck.
- Focusing business process improvement efforts such as Six Sigma on the bottleneck.
- Reducing defective units. Each defective unit that is processed through the bottleneck and subsequently scrapped takes the place of a good unit that could have been sold.

The last three methods of increasing the capacity of the bottleneck are particularly attractive because they are essentially free and may even yield additional cost savings.

The methods and ideas discussed in this section are all part of the Theory of Constraints, which was introduced in the Prologue. A number of organizations have successfully used the Theory of Constraints to improve their performance, including **Avery Dennison, Bethlehem Steel, Binney & Smith, Boeing, Champion International, Ford Motor Company, General Motors, ITT, Monster Cable, National Semiconductor, Pratt and Whitney Canada, Pretoria Academic Hospital, Procter and Gamble, Texas Instruments, United Airlines, United Electrical Controls, the United States Air Force Logistics Command, and the United States Navy Transportation Corps.**

²Setups are required when production switches from one product to another. For example, consider a company that makes automobile side panels. The panels are painted before shipping them to an automobile manufacturer for final assembly. The customer might require 100 blue panels, 50 black panels, and 20 yellow panels. Each time the color is changed, the painting equipment must be purged of the old paint color, cleaned with solvents, and refilled with the new paint color. This takes time. In fact, some equipment may require such lengthy and frequent setups that it is unavailable for actual production more often than not.

IN BUSINESS

Elevating a Constraint

The **Odessa Texas Police Department** was having trouble hiring new employees. Its eight-step hiring process was taking 117 days to complete and the best-qualified job applicants were accepting other employment offers before the Odessa Police Department could finish evaluating their candidacy. The constraint in the eight-step hiring process was the background investigation that required an average of 104 days. The other seven steps—filling out an application and completing a written exam, an oral interview, a polygraph exam, a medical exam, a psychological exam, and a drug screen—took a combined total of only 13 days. The Odessa Police Department elevated its constraint by hiring additional background checkers. This resulted in slashing its application processing time from 117 days to 16 days.

Source: Lloyd J. Taylor III, Brian J. Moersch, and GERALYN McClure Franklin, "Applying the Theory of Constraints to a Public Safety Hiring Process," *Public Personnel Management*, Fall 2003, pp. 367–382.

**CONCEPT
CHECK**


4. A company has received a special order from a customer to make 5,000 units of a customized product. The direct materials cost per unit of the customized product is \$15, the direct labor cost per unit is \$5, and the manufacturing overhead per unit is \$18, including \$6 of variable manufacturing overhead. If the company has sufficient available manufacturing capacity, what is the minimum price that can be accepted for the special order?

a. \$24	c. \$32
b. \$26	d. \$38

5. Refer to the facts from question 4; however, in answering this question assume that the company is operating at 100% of its capacity without the special order. If the company normally manufactures only one product that has a contribution margin of \$20 per unit and that consumes 2 minutes of the constrained resource per unit, what is the opportunity cost (stated in terms of forgone contribution margin) of taking the special order? Assume the special order would require 1.5 minutes of the constrained resource per unit.

a. \$25,000	c. \$75,000
b. \$50,000	d. \$100,000

SUMMARY
LO1 Identify relevant and irrelevant costs and benefits in a decision.

Every decision involves a choice from among at least two alternatives. Only those costs and benefits that differ in total between the alternatives are relevant; costs and benefits that are the same for all alternatives are not affected by the decision and can be ignored. Only future costs that differ between alternatives are relevant. Sunk costs are always irrelevant.

LO2 Prepare an analysis showing whether a product line or other business segment should be dropped or retained.

A decision of whether a product line or other segment should be dropped should focus on the differences in the costs and benefits between dropping or retaining the product line or segment. Caution should be exercised when using reports in which common fixed costs have been allocated among segments. If these common fixed costs are unaffected by the decision of whether

to drop or retain the segment, they are irrelevant and should be removed before determining the real profitability of a segment.

LO3 Prepare a make or buy analysis.

When deciding whether to make or buy a component, focus on the costs and benefits that differ between those two alternatives. As in other decisions, sunk costs—such as the depreciation on old equipment—should be ignored. Future costs that do not differ between alternatives—such as allocations of common fixed costs like general overhead—should be ignored.

LO4 Prepare an analysis showing whether a special order should be accepted.

When deciding whether to accept or reject a special order, focus on the benefits and costs that differ between those two alternatives. Specifically, a special order should be accepted when the incremental revenue from the sale exceeds the incremental cost. As always, sunk costs and future costs that do not differ between the alternatives are irrelevant.

LO5 Determine the most profitable use of a constrained resource and the value of obtaining more of the constrained resource.

When demand for a company's products and services exceeds its ability to supply them, the company has a bottleneck. The bottleneck, whether it is a particular material, skilled labor, or a specific machine, is a constrained resource. Since the company is unable to make everything it could sell, managers must decide what the company will make and what the company will not make. In this situation, the profitability of a product is best measured by its contribution margin per unit of the constrained resource. The products with the highest contribution margin per unit of the constrained resource should be favored.

Managers should focus their attention on effectively managing the constraint. This involves making the best use possible of the constrained resource and increasing the amount of the constrained resource that is available. The value of relaxing the constraint is determined by the contribution margin per unit of the constrained resource for the work that would be done if more of the resource were available.

GUIDANCE ANSWER TO DECISION MAKER

Vice President of Production (p.525)

The annual rental cost for the machinery is an *avoidable* fixed cost. An avoidable fixed cost is a cost that can be eliminated in whole or in part by choosing one alternative over another. Because the annual rental cost of the machinery can be avoided if the company purchases the components from an outside supplier, it is relevant to this decision.

GUIDANCE ANSWERS TO CONCEPT CHECKS

1. **Choices a and d.** Sunk costs are always irrelevant. Fixed costs can be relevant costs.
2. **Choice a.** The cost of the airline ticket to Telluride is a sunk cost; it has already been incurred and the ticket is nonrefundable.
3. **Choice b.** The cost of going to Stowe would be \$1,000 [$\$400 + (\$150 \text{ per night} \times 4 \text{ nights})$] whereas the incremental cost of going to Telluride would be \$1,020 [$\$300 + (\$180 \text{ per night} \times 4 \text{ nights})$]. Note that the \$450 cost of flying to Telluride is irrelevant at this point because it is a sunk cost. The analysis favors Stowe by \$20.
4. **Choice b.** The minimum price would be \$15 direct materials + \$5 direct labor + \$6 variable manufacturing overhead = \$26.
5. **Choice c.** The special order requires 7,500 minutes ($5,000 \text{ units} \times 1.5 \text{ minutes per unit}$). Taking the special order would require sacrificing 3,750 units ($7,500 \text{ minutes} \div 2 \text{ minutes per unit}$) of the regular product. The forgone contribution margin would be $3,750 \text{ units} \times \$20 \text{ per unit} = \$75,000$.



REVIEW PROBLEM: RELEVANT COSTS

Charter Sports Equipment manufactures round, rectangular, and octagonal trampolines. Sales and expense data for the past month follow:

	Total	Trampoline		
		Round	Rectangular	Octagonal
Sales	\$1,000,000	\$140,000	\$500,000	\$360,000
Variable expenses.....	410,000	60,000	200,000	150,000
Contribution margin.....	590,000	80,000	300,000	210,000
Fixed expenses:				
Advertising—traceable	216,000	41,000	110,000	65,000
Depreciation of special equipment	95,000	20,000	40,000	35,000
Line supervisors' salaries	19,000	6,000	7,000	6,000
General factory overhead*	200,000	28,000	100,000	72,000
Total fixed expenses	530,000	95,000	257,000	178,000
Net operating income (loss).....	\$ 60,000	\$ (15,000)	\$ 43,000	\$ 32,000

*A common fixed cost that is allocated on the basis of sales dollars.

Management is concerned about the continued losses shown by the round trampolines and wants a recommendation as to whether or not the line should be discontinued. The special equipment used to produce the trampolines has no resale value. If the round trampoline model is dropped, the two line supervisors assigned to the model would be discharged.

Required:

- Should production and sale of the round trampolines be discontinued? The company has no other use for the capacity now being used to produce the round trampolines. Show computations to support your answer.
- Recast the above data in a format that would be more useful to management in assessing the profitability of the various product lines.

Solution to Review Problem

- No, production and sale of the round trampolines should not be discontinued. Computations to support this answer follow:

Contribution margin lost if the round trampolines are discontinued		\$(80,000)
Less fixed costs that can be avoided:		
Advertising—traceable.....	\$41,000	
Line supervisors' salaries.....	6,000	47,000
Decrease in net operating income for the company as a whole.....		<u>\$(33,000)</u>

- The depreciation of the special equipment is a sunk cost, and therefore it is not relevant to the decision. The general factory overhead is allocated and will presumably continue regardless of whether or not the round trampolines are discontinued; thus, it is not relevant.
- If management wants a clearer picture of the profitability of the segments, the general factory overhead should not be allocated. It is a common cost and therefore should be deducted from the total product-line segment margin, as shown in Chapter 10. A more useful income statement format would be as follows:

	Total	Trampoline		
		Round	Rectangular	Octagonal
Sales	\$1,000,000	\$140,000	\$500,000	\$360,000
Variable expenses	410,000	60,000	200,000	150,000
Contribution margin	590,000	80,000	300,000	210,000
Traceable fixed expenses:				
Advertising—traceable	216,000	41,000	110,000	65,000
Depreciation of special equipment	95,000	20,000	40,000	35,000
Line supervisors' salaries	19,000	6,000	7,000	6,000
Total traceable fixed expenses	330,000	67,000	157,000	106,000
Product-line segment margin	260,000	\$ 13,000	\$143,000	\$104,000
Common fixed expenses	200,000			
Net operating income (loss)	\$ 60,000			

GLOSSARY

- Avoidable cost** A cost that can be eliminated (in whole or in part) by choosing one alternative over another in a decision. This term is synonymous with *relevant cost* and *differential cost*. (p. 510)
- Bottleneck** A machine or some other part of a process that limits the total output of the entire system. (p. 527)
- Constraint** A limitation under which a company must operate, such as limited available machine time or raw materials, that restricts the company's ability to satisfy demand. (p. 526)
- Differential cost** Any cost that differs between alternatives in a decision-making situation. This term is synonymous with *avoidable cost* and *relevant cost*. (p. 511)
- Make or buy decision** A decision concerning whether an item should be produced internally or purchased from an outside supplier. (p. 522)
- Relaxing (or elevating) the constraint** An action that increases the amount of a constrained resource. Equivalently, an action that increases the capacity of the bottleneck. (p. 528)
- Relevant cost** A cost that differs between alternatives in a decision. This term is synonymous with *avoidable cost* and *differential cost*. (p. 510)
- Special order** A one-time order that is not considered part of the company's normal ongoing business. (p. 525)
- Sunk cost** Any cost that has already been incurred and that cannot be changed by any decision made now or in the future. (p. 510)
- Vertical integration** The involvement by a company in more than one of the activities in the entire value chain from development through production, distribution, sales, and after-sales service. (p. 522)

QUESTIONS

- 11-1 What is a *relevant cost*?
- 11-2 Define the following terms: *incremental cost*, *opportunity cost*, and *sunk cost*.
- 11-3 Are variable costs always relevant costs? Explain.
- 11-4 "Sunk costs are easy to spot—they're simply the fixed costs associated with a decision." Do you agree? Explain.
- 11-5 "Variable costs and differential costs mean the same thing." Do you agree? Explain.
- 11-6 "All future costs are relevant in decision making." Do you agree? Why?
- 11-7 Prentice Company is considering dropping one of its product lines. What costs of the product line would be relevant to this decision? Irrelevant?
- 11-8 "If a product line is generating a loss, then it should be discontinued." Do you agree? Explain.

- 11-9 What is the danger in allocating common fixed costs among product lines or other segments of an organization?
- 11-10 How does opportunity cost enter into the make or buy decision?
- 11-11 Give at least four examples of possible constraints.
- 11-12 How will relating product contribution margins to the amount of the constrained resource they consume help a company maximize its profits?
- 11-13 Airlines sometimes offer reduced rates during certain times of the week to members of a businessperson's family if they accompany him or her on trips. How does the concept of relevant costs enter into the decision by the airline to offer reduced rates of this type?



Multiple-choice questions are provided on the text website at www.mhhe.com/brewer5e.

BRIEF EXERCISES *connect*

BRIEF EXERCISE 11-1 Identifying Relevant Costs [LO1]

A number of costs are listed below that may be relevant in decisions faced by the management of Svahn, AB, a Swedish manufacturer of sailing yachts:

Item	Case 1		Case 2	
	Relevant	Not Relevant	Relevant	Not Relevant
a. Sales revenue				
b. Direct materials				
c. Direct labor.....				
d. Variable manufacturing overhead				
e. Depreciation—Model B100 machine				
f. Book value—Model B100 machine.....				
g. Disposal value—Model B100 machine				
h. Market value—Model B300 machine (cost)....				
i. Fixed manufacturing overhead (general)				
j. Variable selling expense.....				
k. Fixed selling expense				
l. General administrative overhead.....				

Required:

Copy the information above onto your answer sheet and place an X in the appropriate column to indicate whether each item is relevant or not relevant in the following situations. Requirement 1 relates to Case 1 above, and requirement 2 relates to Case 2.

- The company chronically has no idle capacity and the old Model B100 machine is the company's constraint. Management is considering purchasing a Model B300 machine to use in addition to the company's present Model B100 machine. The old Model B100 machine will continue to be used to capacity as before, with the new Model B300 machine being used to expand production. This will increase the company's production and sales. The increase in volume will be large enough to require increases in fixed selling expenses and in general administrative overhead, but not in the fixed manufacturing overhead.
- The old Model B100 machine is not the company's constraint, but management is considering replacing it with a new Model B300 machine because of the potential savings in direct materials with the new machine. The Model B100 machine would be sold. This change will have no effect on production or sales, other than some savings in direct materials costs due to less waste.

BRIEF EXERCISE 11-2 Dropping or Retaining a Segment [LO2]

The Regal Cycle Company manufactures three types of bicycles—a dirt bike, a mountain bike, and a racing bike. Data on sales and expenses for the past quarter follow:



	Total	Dirt Bikes	Mountain Bikes	Racing Bikes
Sales	\$300,000	\$90,000	\$150,000	\$60,000
Variable manufacturing and selling expenses.....	<u>120,000</u>	<u>27,000</u>	<u>60,000</u>	<u>33,000</u>
Contribution margin.....	<u>180,000</u>	<u>63,000</u>	<u>90,000</u>	<u>27,000</u>
Fixed expenses:				
Advertising, traceable.....	30,000	10,000	14,000	6,000
Depreciation of special equipment.....	23,000	6,000	9,000	8,000
Salaries of product-line managers.....	35,000	12,000	13,000	10,000
Allocated common fixed expenses*	<u>60,000</u>	<u>18,000</u>	<u>30,000</u>	<u>12,000</u>
Total fixed expenses.....	<u>148,000</u>	<u>46,000</u>	<u>66,000</u>	<u>36,000</u>
Net operating income (loss)	<u>\$ 32,000</u>	<u>\$17,000</u>	<u>\$ 24,000</u>	<u>\$ (9,000)</u>

*Allocated on the basis of sales dollars.

Management is concerned about the continued losses shown by the racing bikes and wants a recommendation as to whether or not the line should be discontinued. The special equipment used to produce racing bikes has no resale value and does not wear out.

Required:

- Should production and sale of the racing bikes be discontinued? Explain. Show computations to support your answer.
- Recast the above data in a format that would be more usable to management in assessing the long-run profitability of the various product lines.

BRIEF EXERCISE 11-3 Make or Buy a Component [LO3]

Troy Engines, Ltd., manufactures a variety of engines for use in heavy equipment. The company has always produced all of the necessary parts for its engines, including all of the carburetors. An outside supplier has offered to sell one type of carburetor to Troy Engines, Ltd., for a cost of \$35 per unit. To evaluate this offer, Troy Engines, Ltd., has gathered the following information relating to its own cost of producing the carburetor internally:

	Per Unit	15,000 Units per Year
Direct materials	\$14	\$210,000
Direct labor.....	10	150,000
Variable manufacturing overhead.....	3	45,000
Fixed manufacturing overhead, traceable.....	6*	90,000
Fixed manufacturing overhead, allocated.....	<u>9</u>	<u>135,000</u>
Total cost	<u>\$42</u>	<u>\$630,000</u>

*One-third supervisory salaries; two-thirds depreciation of special equipment (no resale value).

Required:

1. Assuming that the company has no alternative use for the facilities that are now being used to produce the carburetors, should the outside supplier's offer be accepted? Show all computations.
2. Suppose that if the carburetors were purchased, Troy Engines, Ltd., could use the freed capacity to launch a new product. The segment margin of the new product would be \$150,000 per year. Should Troy Engines, Ltd., accept the offer to buy the carburetors for \$35 per unit? Show all computations.

BRIEF EXERCISE 11-4 Evaluating a Special Order [LO4]

Imperial Jewelers is considering a special order for 20 handcrafted gold bracelets to be given as gifts to members of a wedding party. The normal selling price of a gold bracelet is \$189.95 and its unit product cost is \$149.00 as shown below:

Direct materials	\$ 84.00
Direct labor	45.00
Manufacturing overhead	<u>20.00</u>
Unit product cost	<u>\$149.00</u>

Most of the manufacturing overhead is fixed and unaffected by variations in how much jewelry is produced in any given period. However, \$4.00 of the overhead is variable with respect to the number of bracelets produced. The customer who is interested in the special bracelet order would like special filigree applied to the bracelets. This filigree would require additional materials costing \$2.00 per bracelet and would also require acquisition of a special tool costing \$250 that would have no other use once the special order is completed. This order would have no effect on the company's regular sales and the order could be fulfilled using the company's existing capacity without affecting any other order.

Required:

What effect would accepting this order have on the company's net operating income if a special price of \$169.95 per bracelet is offered for this order? Should the special order be accepted at this price?

**BRIEF EXERCISE 11-5 Utilization of a Constrained Resource [LO5]**

Barlow Company manufactures three products: A, B, and C. The selling price, variable costs, and contribution margin for one unit of each product follow:

	Product		
	A	B	C
Selling price	<u>\$180</u>	<u>\$270</u>	<u>\$240</u>
Variable expenses:			
Direct materials	24	72	32
Other variable expenses	<u>102</u>	<u>90</u>	<u>148</u>
Total variable expenses	<u>126</u>	<u>162</u>	<u>180</u>
Contribution margin	<u>\$ 54</u>	<u>\$108</u>	<u>\$ 60</u>
Contribution margin ratio	30%	40%	25%

The same raw material is used in all three products. Barlow Company has only 5,000 pounds of raw material on hand and will not be able to obtain any more of it for several weeks due to a strike in its supplier's plant. Management is trying to decide which product(s) to concentrate on next week in filling its backlog of orders. The material costs \$8 per pound.

Required:

1. Compute the amount of contribution margin that will be obtained per pound of material used in each product.
2. Which orders would you recommend that the company work on next week—the orders for product A, product B, or product C? Show computations.

3. A foreign supplier could furnish Barlow with additional stocks of the raw material at a substantial premium over the usual price. If there is unfilled demand for all three products, what is the highest price that Barlow Company should be willing to pay for an additional pound of materials? Explain.



EXERCISES

EXERCISE 11-6 Make or Buy a Component [LO3]

Han Products manufactures 30,000 units of part S-6 each year for use on its production line. At this level of activity, the cost per unit for part S-6 is as follows:

Direct materials.....	\$ 3.60
Direct labor.....	10.00
Variable manufacturing overhead.....	2.40
Fixed manufacturing overhead.....	9.00
Total cost per part.....	<u>\$25.00</u>

An outside supplier has offered to sell 30,000 units of part S-6 each year to Han Products for \$21 per part. If Han Products accepts this offer, the facilities now being used to manufacture part S-6 could be rented to another company at an annual rental of \$80,000. However, Han Products has determined that two-thirds of the fixed manufacturing overhead being applied to part S-6 would continue even if part S-6 were purchased from the outside supplier.

Required:

Prepare computations showing how much profits will increase or decrease if the outside supplier's offer is accepted.

EXERCISE 11-7 Identification of Relevant Costs [LO1]

Hollings Company sells and delivers office furniture in the Rocky Mountain area.

The costs associated with the acquisition and annual operation of a delivery truck are given below:



Insurance.....	\$1,600
Licenses.....	\$250
Taxes (vehicle).....	\$150
Garage rent for parking (per truck).....	\$1,200
Depreciation (\$9,000 ÷ 5 years).....	\$1,800*
Gasoline, oil, tires, and repairs.....	\$0.07 per mile

*Based on obsolescence rather than on wear and tear.

Required:

1. Assume that Hollings Company has purchased one truck that has been driven 50,000 miles during the first year. Compute the average cost per mile of owning and operating the truck.
2. At the beginning of the second year, Hollings Company is unsure whether to use the truck or leave it parked in the garage and have all hauling done commercially. (The state requires the payment of vehicle taxes even if the vehicle isn't used.) What costs from the previous list are relevant to this decision? Explain.
3. Assume that the company decides to use the truck during the second year. Near year-end an order is received from a customer over 1,000 miles away. What costs from the above list are relevant in a decision between using the truck to make the delivery and having the delivery done commercially? Explain.
4. Occasionally, the company could use two trucks at the same time. For this reason, some thought is being given to purchasing a second truck. The total miles driven would be the same as if only one truck were owned. What costs from the above list are relevant to a decision over whether to purchase the second truck? Explain.

EXERCISE 11-8 Dropping or Retaining a Segment [LO2]

Thalassines Kataskeves, S.A., of Greece makes marine equipment. The company has been experiencing losses on its bilge pump product line for several years. The most recent quarterly contribution format income statement for the bilge pump product line follows:

Thalassines Kataskeves, S.A. Income Statement—Bilge Pump For the Quarter Ended March 31		
Sales		€850,000
Variable expenses:		
Variable manufacturing expenses	€330,000	
Sales commissions	42,000	
Shipping	<u>18,000</u>	
Total variable expenses		<u>390,000</u>
Contribution margin		460,000
Fixed expenses:		
Advertising	270,000	
Depreciation of equipment (no resale value)	80,000	
General factory overhead	105,000*	
Salary of product-line manager	32,000	
Insurance on inventories	8,000	
Purchasing department	<u>45,000†</u>	
Total fixed expenses		<u>540,000</u>
Net operating loss		<u>€ (80,000)</u>
*Common costs allocated on the basis of machine-hours.		
†Common costs allocated on the basis of sales dollars.		

The currency in Greece is the euro, denoted above by €. Discontinuing the bilge pump product line would not affect sales of other product lines and would have no effect on the company's total general factory overhead or total Purchasing Department expenses.

Required:

Would you recommend that the bilge pump product line be discontinued? Support your answer with appropriate computations.

**EXERCISE 11-9 Identification of Relevant Costs [LO1]**

Bill has just returned from a duck hunting trip. He has brought home eight ducks. Bill's friend, John, disapproves of duck hunting, and to discourage Bill from further hunting, John has presented him with the following cost estimate per duck:

Camper and equipment:		
Cost, \$12,000; usable for eight seasons; 10 hunting trips per season.....		\$150
Travel expense (pickup truck):		
100 miles at \$0.31 per mile (gas, oil, and tires—\$0.21 per mile; depreciation and insurance—\$0.10 per mile).....		31
Shotgun shells (two boxes).....		20
Boat:		
Cost, \$2,320, usable for eight seasons; 10 hunting trips per season.....		29
Hunting license:		
Cost, \$30 for the season; 10 hunting trips per season.....		3
Money lost playing poker:		
Loss, \$24 (Bill plays poker every weekend).....		24
Bottle of whiskey:		
Cost, \$15 (used to ward off the cold)		<u>15</u>
Total cost		<u>\$272</u>
Cost per duck ($\$272 \div 8$ ducks)		<u>\$ 34</u>

Required:

1. Assuming that the duck hunting trip Bill has just completed is typical, what costs are relevant to a decision as to whether Bill should go duck hunting again this season?
2. Suppose that Bill gets lucky on his next hunting trip and shoots 10 ducks in the amount of time it took him to shoot 8 ducks on his last trip. How much would it have cost him to shoot the last two ducks? Explain.
3. Which costs are relevant in a decision of whether Bill should give up hunting? Explain.

EXERCISE 11-10 Utilization of a Constrained Resource [LO5]

Benoit Company produces three products, A, B, and C. Data concerning the three products follow (per unit):

	Product		
	A	B	C
Selling price	\$80	\$56	\$70
Variable expenses:			
Direct materials	24	15	9
Other variable expenses	24	27	40
Total variable expenses	48	42	49
Contribution margin.....	\$32	\$14	\$21
Contribution margin ratio.....	40%	25%	30%

Demand for the company's products is very strong, with far more orders each month than the company can produce with the available raw materials. The same material is used in each product. The material costs \$3 per pound with a maximum of 5,000 pounds available each month.

Required:

Which orders would you advise the company to accept first, those for A, for B, or for C? Which orders second? Third?

EXERCISE 11-11 Special Order [LO4]

Delta Company produces a single product. The cost of producing and selling a single unit of this product at the company's normal activity level of 60,000 units per year is:

Direct materials	\$5.10
Direct labor.....	\$3.80
Variable manufacturing overhead	\$1.00
Fixed manufacturing overhead	\$4.20
Variable selling and administrative expense.....	\$1.50
Fixed selling and administrative expense	\$2.40

The normal selling price is \$21 per unit. The company's capacity is 75,000 units per year. An order has been received from a mail-order house for 15,000 units at a special price of \$14.00 per unit. This order would not affect regular sales.

Required:

1. If the order is accepted, by how much will annual profits be increased or decreased? (The order will not change the company's total fixed costs.)
2. Assume the company has 1,000 units of this product left over from last year that are inferior to the current model. The units must be sold through regular channels at reduced prices. What unit cost is relevant for establishing a minimum selling price for these units? Explain.



**EXERCISE 11-12 Dropping or Retaining a Segment [LO2]**

Bed & Bath, a retailing company, has two departments, Hardware and Linens. The company's most recent monthly contribution format income statement follows:

	Total	Department	
		Hardware	Linens
Sales	\$4,000,000	\$3,000,000	\$1,000,000
Variable expenses	1,300,000	900,000	400,000
Contribution margin.....	2,700,000	2,100,000	600,000
Fixed expenses.....	2,200,000	1,400,000	800,000
Net operating income (loss)	\$ 500,000	\$ 700,000	\$ (200,000)

A study indicates that \$340,000 of the fixed expenses being charged to Linens are sunk costs or allocated costs that will continue even if the Linens Department is dropped. In addition, the elimination of the Linens Department will result in a 10% decrease in the sales of the Hardware Department.

Required:

If the Linens Department is dropped, what will be the effect on the net operating income of the company as a whole?

EXERCISE 11-13 Make or Buy a Component [LO3]

For many years Futura Company has purchased the starters that it installs in its standard line of farm tractors. Due to a reduction in output, the company has idle capacity that could be used to produce the starters. The chief engineer has recommended against this move, however, pointing out that the cost to produce the starters would be greater than the current \$8.40 per unit purchase price:

	Per Unit	Total
Direct materials	\$3.10	
Direct labor.....	2.70	
Supervision	1.50	\$60,000
Depreciation.....	1.00	\$40,000
Variable manufacturing overhead...	0.60	
Rent	0.30	\$12,000
Total production cost.....	<u>\$9.20</u>	

A supervisor would have to be hired to oversee production of the starters. However, the company has sufficient idle tools and machinery that no new equipment would have to be purchased. The rent charge above is based on space utilized in the plant. The total rent on the plant is \$80,000 per period. Depreciation is due to obsolescence rather than wear and tear.

Required:

Prepare computations showing how much profits will increase or decrease as a result of making the starters.

**EXERCISE 11-14 Identification of Relevant Costs [LO1]**

Kristen Lu purchased a used automobile for \$8,000 at the beginning of last year and incurred the following operating costs:

Depreciation (\$8,000 ÷ 5 years).....	\$1,600
Insurance	\$1,200
Garage rent.....	\$360
Automobile tax and license	\$40
Variable operating cost.....	\$0.14 per mile

The variable operating cost consists of gasoline, oil, tires, maintenance, and repairs. Kristen estimates that, at her current rate of usage, the car will have zero resale value in five years, so the annual straight-line depreciation is \$1,600. The car is kept in a garage for a monthly fee.

Required:

1. Kristen drove the car 10,000 miles last year. Compute the average cost per mile of owning and operating the car.
2. Kristen is unsure about whether she should use her own car or rent a car to go on an extended cross-country trip for two weeks during spring break. What costs above are relevant in this decision? Explain.
3. Kristen is thinking about buying an expensive sports car to replace the car she bought last year. She would drive the same number of miles regardless of which car she owns and would rent the same parking space. The sports car's variable operating costs would be roughly the same as the variable operating costs of her old car. However, her insurance and automobile tax and license costs would go up. What costs are relevant in estimating the incremental cost of owning the more expensive car? Explain.



PROBLEMS

Alternate problem set is available on the text website.

PROBLEM 11-15A Dropping or Retaining a Flight [LO2]

Profits have been decreasing for several years at Pegasus Airlines. In an effort to improve the company's performance, consideration is being given to dropping several flights that appear to be unprofitable.

A typical income statement for one round-trip of one such flight (flight 482) is as follows:

CHECK FIGURE

- (1) Decrease in profits:
\$3,200



Ticket revenue (175 seats × 40% occupancy × \$200 ticket price).....	\$14,000	100.0%
Variable expenses (\$15 per person).....	1,050	7.5
Contribution margin.....	12,950	92.5%
Flight expenses:		
Salaries, flight crew	1,800	
Flight promotion.....	750	
Depreciation of aircraft	1,550	
Fuel for aircraft	5,800	
Liability insurance.....	4,200	
Salaries, flight assistants.....	1,500	
Baggage loading and flight preparation.....	1,700	
Overnight costs for flight crew and assistants at destination	300	
Total flight expenses.....	17,600	
Net operating loss.....	\$ (4,650)	

The following additional information is available about flight 482:

- a. Members of the flight crew are paid fixed annual salaries, whereas the flight assistants are paid based on the number of round trips they complete.
- b. One-third of the liability insurance is a special charge assessed against flight 482 because in the opinion of the insurance company, the destination of the flight is in a "high-risk" area. The remaining two-thirds would be unaffected by a decision to drop flight 482.
- c. The baggage loading and flight preparation expense is an allocation of ground crews' salaries and depreciation of ground equipment. Dropping flight 482 would have no effect on the company's total baggage loading and flight preparation expenses.
- d. If flight 482 is dropped, Pegasus Airlines has no authorization at present to replace it with another flight.

- e. Aircraft depreciation is due entirely to obsolescence. Depreciation due to wear and tear is negligible.
- f. Dropping flight 482 would not allow Pegasus Airlines to reduce the number of aircraft in its fleet or the number of flight crew on its payroll.

Required:

1. Prepare an analysis showing what impact dropping flight 482 would have on the airline's profits.
2. The airline's scheduling officer has been criticized because only about 50% of the seats on Pegasus' flights are being filled compared to an industry average of 60%. The scheduling officer has explained that Pegasus' average seat occupancy could be improved considerably by eliminating about 10% of its flights, but that doing so would reduce profits. Explain how this could happen.

CHECK FIGURE

- (1) \$40,000 disadvantage to close



PROBLEM 11-16A Shutting Down or Continuing to Operate a Plant [LO2]

(Note: This type of decision is similar to dropping a product line.)

Birch Company normally produces and sells 30,000 units of RG-6 each month. RG-6 is a small electrical relay used as a component part in the automotive industry. The selling price is \$22 per unit, variable costs are \$14 per unit, fixed manufacturing overhead costs total \$150,000 per month, and fixed selling costs total \$30,000 per month.

Employment-contract strikes in the companies that purchase the bulk of the RG-6 units have caused Birch Company's sales to temporarily drop to only 8,000 units per month. Birch Company estimates that the strikes will last for two months, after which time sales of RG-6 should return to normal. Due to the current low level of sales, Birch Company is thinking about closing down its own plant during the strike, which would reduce its fixed manufacturing overhead costs by \$45,000 per month and its fixed selling costs by 10%. Start-up costs at the end of the shutdown period would total \$8,000. Because Birch Company uses Lean Production methods, no inventories are on hand.

Required:

1. Assuming that the strikes continue for two months, would you recommend that Birch Company close its own plant? Explain. Show computations.
2. At what level of sales (in units) for the two-month period should Birch Company be indifferent between closing the plant or keeping it open? Show computations. (Hint: This is a type of break-even analysis, except that the fixed cost portion of your break-even computation should include only those fixed costs that are relevant [i.e., avoidable] over the two-month period.)

CHECK FIGURE

- (1) Dropping housekeeping would decrease overall net operating income by \$28,000



PROBLEM 11-17A Dropping or Retaining a Segment [LO2]

Jackson County Senior Services is a nonprofit organization devoted to providing essential services to seniors who live in their own homes within the Jackson County area. Three services are provided for seniors—home nursing, meals on wheels, and housekeeping. In the home nursing program, nurses visit seniors on a regular basis to check on their general health and to perform tests ordered by their physicians. The meals on wheels program delivers a hot meal once a day to each senior enrolled in the program. The housekeeping service provides weekly housecleaning and maintenance services. Data on revenue and expenses for the past year follow:

	Total	Home Nursing	Meals on Wheels	House-keeping
Revenues.....	\$900,000	\$260,000	\$400,000	\$240,000
Variable expenses.....	490,000	120,000	210,000	160,000
Contribution margin.....	410,000	140,000	190,000	80,000
Fixed expenses:				
Depreciation.....	68,000	8,000	40,000	20,000
Liability insurance.....	42,000	20,000	7,000	15,000
Program administrators' salaries.....	115,000	40,000	38,000	37,000
General administrative overhead*.....	180,000	52,000	80,000	48,000
Total fixed expenses.....	405,000	120,000	165,000	120,000
Net operating income (loss).....	\$ 5,000	\$ 20,000	\$ 25,000	\$ (40,000)

*Allocated on the basis of program revenues.

The head administrator of Jackson County Senior Services, Judith Miyama, is concerned about the organization's finances and considers the net operating income of \$5,000 last year to be razor-thin. (Last year's results were very similar to the results for previous years and are representative of what would be expected in the future.) She feels that the organization should be building its financial reserves at a more rapid rate in order to prepare for the next inevitable recession. After seeing the above report, Ms. Miyama asked for more information about the financial advisability of perhaps discontinuing the housekeeping program.

The depreciation in housekeeping is for a small van that is used to carry the housekeepers and their equipment from job to job. If the program were discontinued, the van would be donated to a charitable organization. None of the general administrative overhead would be avoided if the housekeeping program were dropped, but the liability insurance and the salary of the program administrator would be avoided.

Required:

- Should the housekeeping program be discontinued? Explain. Show computations to support your answer.
- Recast the above data in a format that would be more useful to management in assessing the long-run financial viability of the various services.

PROBLEM 11-18A Make or Buy Decision [LO3]

Silven Industries, which manufactures and sells a highly successful line of summer lotions and insect repellents, has decided to diversify in order to stabilize sales throughout the year. A natural area for the company to consider is the production of winter lotions and creams to prevent dry and chapped skin.

After considerable research, a winter products line has been developed. However, Silven's president has decided to introduce only one of the new products for this coming winter. If the product is a success, further expansion in future years will be initiated.

The product selected (called Chap-Off) is a lip balm that will be sold in a lipstick-type tube. The product will be sold to wholesalers in boxes of 24 tubes for \$8 per box. Because of excess capacity, no additional fixed manufacturing overhead costs will be incurred to produce the product. However, a \$90,000 charge for fixed manufacturing overhead will be absorbed by the product under the company's absorption costing system.

Using the estimated sales and production of 100,000 boxes of Chap-Off, the Accounting Department has developed the following cost per box:

Direct material.....	\$3.60
Direct labor.....	2.00
Manufacturing overhead.....	1.40
Total cost.....	<u>\$7.00</u>

The costs above include costs for producing both the lip balm and the tube that contains it. As an alternative to making the tubes, Silven has approached a supplier to discuss the possibility of purchasing the tubes for Chap-Off. The purchase price of the empty tubes from the supplier would be \$1.35 per box of 24 tubes. If Silven Industries accepts the purchase proposal, direct labor and variable manufacturing overhead costs per box of Chap-Off would be reduced by 10% and direct materials costs would be reduced by 25%.

Required:

- Should Silven Industries make or buy the tubes? Show calculations to support your answer.
- What would be the maximum purchase price acceptable to Silven Industries? Explain.
- Instead of sales of 100,000 boxes, revised estimates show a sales volume of 120,000 boxes. At this new volume, additional equipment must be acquired to manufacture the tubes at an annual rental of \$40,000. Assuming that the outside supplier will not accept an order for less than 100,000 boxes, should Silven Industries make or buy the tubes? Show computations to support your answer.
- Refer to the data in (3) above. Assume that the outside supplier will accept an order of any size for the tubes at \$1.35 per box. How, if at all, would this change your answer? Show computations.
- What qualitative factors should Silven Industries consider in determining whether they should make or buy the tubes?

(CMA, adapted)

CHECK FIGURE

(1) \$0.20 savings per box to make



CHECK FIGURE

(1) \$29,800 disadvantage to close


**PROBLEM 11-19A Close or Retain a Store [LO2]**

Superior Markets, Inc., operates three stores in a large metropolitan area. A segmented absorption costing income statement for the company for the last quarter is given below:

Superior Markets, Inc.				
Income Statement				
For the Quarter Ended September 30				
	Total	North Store	South Store	East Store
Sales	\$3,000,000	\$720,000	\$1,200,000	\$1,080,000
Cost of goods sold	1,657,200	403,200	660,000	594,000
Gross margin	<u>1,342,800</u>	<u>316,800</u>	<u>540,000</u>	<u>486,000</u>
Selling and administrative expenses:				
Selling expenses	817,000	231,400	315,000	270,600
Administrative expenses	383,000	106,000	150,900	126,100
Total expenses.....	<u>1,200,000</u>	<u>337,400</u>	<u>465,900</u>	<u>396,700</u>
Net operating income (loss).....	<u>\$ 142,800</u>	<u>\$ (20,600)</u>	<u>\$ 74,100</u>	<u>\$ 89,300</u>

The North Store has consistently shown losses over the past two years. For this reason, management is giving consideration to closing the store. The company has asked you to make a recommendation as to whether the store should be closed or kept open. The following additional information is available for your use:

a. The breakdown of the selling and administrative expenses is as follows:

	Total	North Store	South Store	East Store
Selling expenses:				
Sales salaries	\$239,000	\$ 70,000	\$ 89,000	\$ 80,000
Direct advertising.....	187,000	51,000	72,000	64,000
General advertising*	45,000	10,800	18,000	16,200
Store rent.....	300,000	85,000	120,000	95,000
Depreciation of store fixtures.....	16,000	4,600	6,000	5,400
Delivery salaries	21,000	7,000	7,000	7,000
Depreciation of delivery equipment.....	9,000	3,000	3,000	3,000
Total selling expenses	<u>\$817,000</u>	<u>\$231,400</u>	<u>\$315,000</u>	<u>\$270,600</u>

*Allocated on the basis of sales dollars.

	Total	North Store	South Store	East Store
Administrative expenses:				
Store management salaries	\$ 70,000	\$ 21,000	\$ 30,000	\$ 19,000
General office salaries*	50,000	12,000	20,000	18,000
Insurance on fixtures and inventory	25,000	7,500	9,000	8,500
Utilities.....	106,000	31,000	40,000	35,000
Employment taxes.....	57,000	16,500	21,900	18,600
General office—other*	75,000	18,000	30,000	27,000
Total administrative expenses	<u>\$383,000</u>	<u>\$106,000</u>	<u>\$150,900</u>	<u>\$126,100</u>

*Allocated on the basis of sales dollars.

- b. The lease on the building housing the North Store can be broken with no penalty.
- c. The fixtures being used in the North Store would be transferred to the other two stores if the North Store were closed.
- d. The general manager of the North Store would be retained and transferred to another position in the company if the North Store were closed. She would be filling a position that would otherwise be filled by hiring a new employee at a salary of \$11,000 per quarter. The general manager of the North Store would be retained at her normal salary of \$12,000 per quarter. All other employees in the store would be discharged.
- e. The company has one delivery crew that serves all three stores. One delivery person could be discharged if the North Store were closed. This person's salary is \$4,000 per quarter. The delivery equipment would be distributed to the other stores. The equipment does not wear out through use, but does eventually become obsolete.
- f. The company's employment taxes are 15% of salaries.
- g. One-third of the insurance in the North Store is on the store's fixtures.
- h. The "General office salaries" and "General office—other" relate to the overall management of Superior Markets, Inc. If the North Store were closed, one person in the general office could be discharged because of the decrease in overall workload. This person's compensation is \$6,000 per quarter.

Required:

1. Prepare a schedule showing the change in revenues and expenses and the impact on the company's overall net operating income that would result if the North Store were closed.
2. Assuming that the store space can't be subleased, what recommendation would you make to the management of Superior Markets, Inc.?
3. Disregard requirement 2. Assume that if the North Store were closed, at least one-fourth of its sales would transfer to the East Store, due to strong customer loyalty to Superior Markets. The East Store has enough capacity to handle the increased sales. You may assume that the increased sales in the East Store would yield the same gross margin as a percentage of sales as present sales in that store. What effect would these factors have on your recommendation concerning the North Store? Show all computations to support your answer.

PROBLEM 11-20A Relevant Cost Analysis in a Variety of Situations [LO2, LO3, LO4]

Andretti Company has a single product called a Dak. The company normally produces and sells 60,000 Daks each year at a selling price of \$32 per unit. The company's unit costs at this level of activity are given below:

Direct materials	\$10.00	
Direct labor.....	4.50	
Variable manufacturing overhead	2.30	
Fixed manufacturing overhead	5.00	(\$300,000 total)
Variable selling expenses	1.20	
Fixed selling expenses.....	3.50	(\$210,000 total)
Total cost per unit	<u>\$26.50</u>	

CHECK FIGURE

- (1) \$130,000 incremental net operating income;
- (2) \$22.15 break-even price



A number of questions relating to the production and sale of Daks follow. Each question is independent.

Required:

1. Assume that Andretti Company has sufficient capacity to produce 90,000 Daks each year without any increase in fixed manufacturing overhead costs. The company could increase its sales by 25% above the present 60,000 units each year if it were willing to increase the fixed selling expenses by \$80,000. Would the increased fixed selling expenses be justified?
2. Assume again that Andretti Company has sufficient capacity to produce 90,000 Daks each year. A customer in a foreign market wants to purchase 20,000 Daks. Import duties on the Daks would be \$1.70 per unit, and costs for permits and licenses would be \$9,000. The only selling costs that would be associated with the order would be \$3.20 per unit shipping cost. Compute the per unit break-even price on this order.
3. The company has 1,000 Daks on hand that have some irregularities and are therefore considered to be "seconds." Due to the irregularities, it will be impossible to sell these units at the normal price through regular distribution channels. What unit cost figure is relevant for setting a minimum selling price? Explain.

4. Due to a strike in its supplier's plant, Andretti Company is unable to purchase more material for the production of Daks. The strike is expected to last for two months. Andretti Company has enough material on hand to operate at 30% of normal levels for the two-month period. As an alternative, Andretti could close its plant down entirely for the two months. If the plant were closed, fixed manufacturing overhead costs would continue at 60% of their normal level during the two-month period and the fixed selling expenses would be reduced by 20%. What would be the impact on profits of closing the plant for the two-month period?
5. An outside manufacturer has offered to produce Daks and ship them directly to Andretti's customers. If Andretti Company accepts this offer, the facilities that it uses to produce Daks would be idle; however, fixed manufacturing overhead costs would be reduced by 75%. Because the outside manufacturer would pay for all shipping costs, the variable selling expenses would be only two-thirds of their present amount. Compute the unit cost that is relevant for comparison to the price quoted by the outside manufacturer.

CHECK FIGURE

(1) f136,000 advantage
to buy

**PROBLEM 11-21A Make or Buy Analysis [LO3]**

"In my opinion, we ought to stop making our own drums and accept that outside supplier's offer," said Wim Niewindt, managing director of Antilles Refining, N.V., of Aruba. "At a price of 18 florins per drum, we would be paying 5 florins less than it costs us to manufacture the drums in our own plant. (The currency in Aruba is the florin, denoted below by fl.) Because we use 60,000 drums a year, that would be an annual cost savings of 300,000 florins." Antilles Refining's present cost to manufacture one drum is given below (based on 60,000 drums per year):

Direct materials	f110.35
Direct labor	6.00
Variable overhead	1.50
Fixed overhead (f12.80 general company overhead, f11.60 depreciation and, f10.75 supervision)	5.15
Total cost per drum	<u>f123.00</u>

A decision about whether to make or buy the drums is especially important at this time because the equipment being used to make the drums is completely worn out and must be replaced. The choices facing the company are:

Alternative 1: Rent new equipment and continue to make the drums. The equipment would be rented for f1135,000 per year.

Alternative 2: Purchase the drums from an outside supplier at f118 per drum.

The new equipment would be more efficient than the equipment that Antilles Refining has been using and, according to the manufacturer, would reduce direct labor and variable overhead costs by 30%. The old equipment has no resale value. Supervision cost (f145,000 per year) and direct materials cost per drum would not be affected by the new equipment. The new equipment's capacity would be 90,000 drums per year.

The company's total general company overhead would be unaffected by this decision.

Required:

1. To assist the managing director in making a decision, prepare an analysis showing the total cost and the cost per drum for each of the two alternatives given above. Assume that 60,000 drums are needed each year. Which course of action would you recommend to the managing director?
2. Would your recommendation in (1) above be the same if the company's needs were: (a) 75,000 drums per year or (b) 90,000 drums per year? Show computations to support your answer, with costs presented on both a total and a per unit basis.
3. What other factors would you recommend that the company consider before making a decision?

CHECK FIGURE

(1) Increased profit:
\$65,000

**PROBLEM 11-22A Accept or Reject a Special Order [LO4]**

Polaski Company manufactures and sells a single product called a Ret. Operating at capacity, the company can produce and sell 30,000 Ret's per year. Costs associated with this level of production and sales are given below:

	Unit	Total
Direct materials.....	\$15	\$ 450,000
Direct labor.....	8	240,000
Variable manufacturing overhead.....	3	90,000
Fixed manufacturing overhead.....	9	270,000
Variable selling expense.....	4	120,000
Fixed selling expense.....	6	180,000
Total cost.....	<u>\$45</u>	<u>\$1,350,000</u>

The Rets normally sell for \$50 each. Fixed manufacturing overhead is constant at \$270,000 per year within the range of 25,000 through 30,000 Rets per year.

Required:

1. Assume that due to a recession, Polaski Company expects to sell only 25,000 Rets through regular channels next year. A large retail chain has offered to purchase 5,000 Rets if Polaski is willing to accept a 16% discount off the regular price. There would be no sales commissions on this order; thus, variable selling expenses would be slashed by 75%. However, Polaski Company would have to purchase a special machine to engrave the retail chain's name on the 5,000 units. This machine would cost \$10,000. Polaski Company has no assurance that the retail chain will purchase additional units in the future. Determine the impact on profits next year if this special order is accepted.
2. Refer to the original data. Assume again that Polaski Company expects to sell only 25,000 Rets through regular channels next year. The U.S. Army would like to make a one-time-only purchase of 5,000 Rets. The Army would pay a fixed fee of \$1.80 per Ret, and it would reimburse Polaski Company for all costs of production (variable and fixed) associated with the units. Because the army would pick up the Rets with its own trucks, there would be no variable selling expenses associated with this order. If Polaski Company accepts the order, by how much will profits increase or decrease for the year?
3. Assume the same situation as that described in (2) above, except that the company expects to sell 30,000 Rets through regular channels next year. Thus, accepting the U.S. Army's order would require giving up regular sales of 5,000 Rets. If the Army's order is accepted, by how much will profits increase or decrease from what they would be if the 5,000 Rets were sold through regular channels?

PROBLEM 11-23A Utilization of a Constrained Resource [LO5]

The Walton Toy Company manufactures a line of dolls and a doll dress sewing kit. Demand for the dolls is increasing, and management requests assistance from you in determining an economical sales and production mix for the coming year. The company has provided the following data:

CHECK FIGURE

(2) 140,000 total hours

	A	B	C	D	E	F
		Demand Next Year (units)	Selling Price per Unit	Direct Materials	Direct Labor	
1	Product					
2	Debbie	50,000	\$13.50	\$4.30	\$3.20	
3	Trish	42,000	\$5.50	\$1.10	\$2.00	
4	Sarah	35,000	\$21.00	\$6.44	\$5.80	
5	Mike	40,000	\$10.00	\$2.00	\$4.00	
6	Sewing kit	325,000	\$8.00	\$3.20	\$1.60	
7						



The following additional information is available:

- a. The company's plant has a capacity of 130,000 direct labor-hours per year on a single-shift basis. The company's present employees and equipment can produce all five products.
- b. The direct labor rate of \$8 per hour is expected to remain unchanged during the coming year.
- c. Fixed costs total \$520,000 per year. Variable overhead costs are \$2 per direct labor-hour.
- d. All of the company's nonmanufacturing costs are fixed.
- e. The company's finished goods inventory is negligible and can be ignored.

Required:

1. Determine the contribution margin per direct labor-hour expended on each product.
2. Prepare a schedule showing the total direct labor-hours that will be required to produce the units estimated to be sold during the coming year.
3. Examine the data you have computed in (1) and (2) above. How would you allocate the 130,000 direct labor hours of capacity to Walton Toy Company's various products?
4. What is the highest price, in terms of a rate per hour, that Walton Toy Company would be willing to pay for additional capacity (that is, for added direct labor time)?
5. Assume again that the company does not want to reduce sales of any product. Identify ways in which the company could obtain the additional output.

(CMA, adapted)

BUILDING YOUR SKILLS



ANALYTICAL THINKING [LO1, LO3, LO5]

TufStuff, Inc., sells a wide range of drums, bins, boxes, and other containers that are used in the chemical industry. One of the company's products is a heavy-duty corrosion-resistant metal drum, called the WVD drum, used to store toxic wastes. Production is constrained by the capacity of an automated welding machine that is used to make precision welds. A total of 2,000 hours of welding time is available annually on the machine. Because each drum requires 0.4 hours of welding time, annual production is limited to 5,000 drums. At present, the welding machine is used exclusively to make the WVD drums. The accounting department has provided the following financial data concerning the WVD drums:

WVD Drums	
Selling price per drum	\$149.00
Cost per drum:	
Direct materials	\$52.10
Direct labor (\$18 per hour)	3.60
Manufacturing overhead.....	4.50
Selling and administrative expense.....	29.80
	<u>90.00</u>
Margin per drum.....	<u>\$ 59.00</u>

Management believes 6,000 WVD drums could be sold each year if the company had sufficient manufacturing capacity. As an alternative to adding another welding machine, management has considered buying additional drums from an outside supplier. Harcor Industries, Inc., a supplier of quality products, would be able to provide up to 4,000 WVD-type drums per year at a price of \$138 per drum, which TufStuff would resell to its customers at its normal selling price after appropriate relabeling.

Megan Flores, TufStuff's production manager, has suggested that the company could make better use of the welding machine by manufacturing bike frames, which would require only 0.5 hours of welding time per frame and yet sell for far more than the drums. Megan believes that TufStuff could sell up to 1,600 bike frames per year to bike manufacturers at a price of \$239 each. The accounting department has provided the following data concerning the proposed new product:

Bike Frames	
Selling price per frame.....	\$239.00
Cost per frame:	
Direct materials	\$99.40
Direct labor (\$18 per hour)	28.80
Manufacturing overhead.....	36.00
Selling and administrative expense.....	47.80
	<u>212.00</u>
Margin per frame.....	<u>\$ 27.00</u>

The bike frames could be produced with existing equipment and personnel. Manufacturing overhead is allocated to products on the basis of direct labor-hours. Most of the manufacturing overhead consists of fixed common costs such as rent on the factory building, but some of it is variable. The variable manufacturing overhead has been estimated at \$1.35 per WVD drum and \$1.90 per bike frame. The variable manufacturing overhead cost would not be incurred on drums acquired from the outside supplier.

Selling and administrative expenses are allocated to products on the basis of revenues. Almost all of the selling and administrative expenses are fixed common costs, but it has been estimated that variable selling and administrative expenses amount to \$0.75 per WVD drum whether made or purchased and would be \$1.30 per bike frame.

All of the company's employees—direct and indirect—are paid for full 40-hour workweeks and the company has a policy of laying off workers only in major recessions.

Required:

1. Given the margins of the two products as indicated in the reports submitted by the accounting department, does it make sense to consider producing the bike frames? Explain.
2. Compute the contribution margin per unit for:
 - a. Purchased WVD drums.
 - b. Manufactured WVD drums.
 - c. Manufactured bike frames.
3. Determine the number of WVD drums (if any) that should be purchased and the number of WVD drums and/or bike frames (if any) that should be manufactured. What is the increase in net operating income that would result from this plan over current operations?

As soon as your analysis was shown to the top management team at TufStuff, several managers got into an argument concerning how direct labor costs should be treated when making this decision. One manager argued that direct labor is always treated as a variable cost in textbooks and in practice and has always been considered a variable cost at TufStuff. After all, "direct" means you can directly trace the cost to products. "If direct labor is not a variable cost, what is?" Another manager argued just as strenuously that direct labor should be considered a fixed cost at TufStuff. No one had been laid off in over a decade, and for all practical purposes, everyone at the plant is on a monthly salary. Everyone classified as direct labor works a regular 40-hour workweek and overtime has not been necessary since the company adopted Lean Production techniques. Whether the welding machine is used to make drums or frames, the total payroll would be exactly the same. There is enough slack, in the form of idle time, to accommodate any increase in total direct labor time that the bike frames would require.

4. Redo requirements (2) and (3) making the opposite assumption about direct labor from the one you originally made. In other words, if you treated direct labor as a variable cost, redo the analysis treating it as a fixed cost. If you treated direct labor as a fixed cost, redo the analysis treating it as a variable cost.
5. What do you think is the correct way to treat direct labor cost in this situation—as variable or as fixed? Explain.

COMMUNICATING IN PRACTICE [LO3]

Bronson Company manufactures a variety of ballpoint pens. The company has just received an offer from an outside supplier to provide the ink cartridge for the company's Zippo pen line, at a price of \$0.48 per dozen cartridges. The company is interested in this offer because its own production of cartridges is at capacity.

Bronson Company estimates that if the supplier's offer were accepted, the direct labor and variable overhead costs of the Zippo pen line would be reduced by 10% and the direct materials cost would be reduced by 20%.

Under present operations, Bronson Company manufactures all of its own pens from start to finish. The Zippo pens are sold through wholesalers at \$4.00 per box. Each box contains one dozen pens. Fixed overhead costs charged to the Zippo pen line total \$50,000 each year. (The same equipment and facilities are used to produce several pen lines.) The present cost of producing one dozen Zippo pens (one box) is given below:

Direct materials.....	\$1.50
Direct labor.....	1.00
Manufacturing overhead.....	0.80*
Total cost.....	<u>\$3.30</u>

*Includes both variable and fixed manufacturing overhead, based on production of 100,000 boxes of pens each year.

CHECK FIGURE

(1) \$0.05 savings per box to make

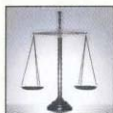


Required

Write a memorandum to the president of Bronson Company that answers the following questions. Include computations to support your answer as appropriate.

1. Should Bronson Company accept the outside supplier's offer?
2. What is the maximum price that Bronson Company should be willing to pay the outside supplier per dozen cartridges?
3. Due to the bankruptcy of a competitor, Bronson Company could sell as many as 150,000 boxes of Zippo pens next year. As stated above, the company presently has enough capacity to produce the cartridges for only 100,000 boxes of Zippo pens annually. By incurring \$30,000 in added fixed cost each year, the company could expand its production of cartridges to satisfy the anticipated demand for Zippo pens. The variable cost per unit to produce the additional cartridges would be the same as at present. Under these circumstances, how many boxes of cartridges should be purchased from the outside supplier and how many should be made by Bronson?
4. What qualitative factors should Bronson Company consider in this make or buy decision?

(CMA, adapted)

**ETHICS CHALLENGE CASE [LO2]**

Haley Romeros had just been appointed vice president of the Rocky Mountain Region of the Bank Services Corporation (BSC). The company provides check processing services for small banks. The banks send checks presented for deposit or payment to BSC, which records the data on each check in a computerized database. BSC then sends the data electronically to the nearest Federal Reserve Bank check-clearing center where the appropriate transfers of funds are made between banks. The Rocky Mountain Region has three check processing centers, which are located in Billings, Montana; Great Falls, Montana; and Clayton, Idaho. Prior to her promotion to vice president, Ms. Romeros had been the manager of a check processing center in New Jersey.

Immediately after assuming her new position, Ms. Romeros requested a complete financial report for the just-ended fiscal year from the region's controller, John Littlebear. Ms. Romeros specified that the financial report should follow the standardized format required by corporate headquarters for all regional performance reports. That report follows:

**Bank Services Corporation (BSC)
Rocky Mountain Region
Financial Performance**

	Total	Check Processing Centers		
		Billings	Great Falls	Clayton
Sales	\$50,000,000	\$20,000,000	\$18,000,000	\$12,000,000
Operating expenses:				
Direct labor	32,000,000	12,500,000	11,000,000	8,500,000
Variable overhead	850,000	350,000	310,000	190,000
Equipment depreciation	3,900,000	1,300,000	1,400,000	1,200,000
Facility expense	2,800,000	900,000	800,000	1,100,000
Local administrative expense*	450,000	140,000	160,000	150,000
Regional administrative expense†	1,500,000	600,000	540,000	360,000
Corporate administrative expense‡	4,750,000	1,900,000	1,710,000	1,140,000
Total operating expense	46,250,000	17,690,000	15,920,000	12,640,000
Net operating income	\$ 3,750,000	\$ 2,310,000	\$ 2,080,000	\$ (640,000)

*Local administrative expenses are the administrative expenses incurred at the check processing centers.

†Regional administrative expenses are allocated to the check processing centers based on sales.

‡Corporate administrative expenses are charged to segments of the company such as the Rocky Mountain Region and the check processing centers at the rate of 9.5% of their sales.

Upon seeing this report, Ms. Romeros summoned John Littlebear for an explanation.

Romeros: What's the story on Clayton? It didn't have a loss the previous year did it?

Littlebear: No, the Clayton facility has had a nice profit every year since it was opened six years ago, but Clayton lost a big contract this year.

Romeros: Why?

Littlebear: One of our national competitors entered the local market and bid very aggressively on the contract. We couldn't afford to meet the bid. Clayton's costs—particularly their facility expenses—are just too high. When Clayton lost the contract, we had to lay off a lot of employees, but we could not reduce the fixed costs of the Clayton facility.

Romeros: Why is Clayton's facility expense so high? It's a smaller facility than either Billings or Great Falls and yet its facility expense is higher.

Littlebear: The problem is that we are able to rent suitable facilities very cheaply at Billings and Great Falls. No such facilities were available at Clayton; we had them built. Unfortunately, there were big cost overruns. The contractor we hired was inexperienced at this kind of work and in fact went bankrupt before the project was completed. After hiring another contractor to finish the work, we were way over budget. The large depreciation charges on the facility didn't matter at first because we didn't have much competition at the time and could charge premium prices.

Romeros: Well we can't do that anymore. The Clayton facility will obviously have to be shut down. Its business can be shifted to the other two check processing centers in the region.

Littlebear: I would advise against that. The \$1,200,000 in depreciation at the Clayton facility is misleading. That facility should last indefinitely with proper maintenance. And it has no resale value; there is no other commercial activity around Clayton.

Romeros: What about the other costs at Clayton?

Littlebear: If we shifted Clayton's business over to the other two processing centers in the region, we wouldn't save anything on direct labor or variable overhead costs. We might save \$90,000 or so in local administrative expense, but we would not save any regional administrative expense and corporate headquarters would still charge us 9.5% of our sales as corporate administrative expense.

In addition, we would have to rent more space in Billings and Great Falls in order to handle the work transferred from Clayton; that would probably cost us at least \$600,000 a year. And don't forget that it will cost us something to move the equipment from Clayton to Billings and Great Falls. And the move will disrupt service to customers.

Romeros: I understand all of that, but a money-losing processing center on my performance report is completely unacceptable.

Littlebear: And if you shut down Clayton, you are going to throw some loyal employees out of work.

Romeros: That's unfortunate, but we have to face hard business realities.

Littlebear: And you would have to write off the investment in the facilities at Clayton.

Romeros: I can explain a write-off to corporate headquarters; hiring an inexperienced contractor to build the Clayton facility was my predecessor's mistake. But they'll have my head at headquarters if I show operating losses every year at one of my processing centers. Clayton has to go. At the next corporate board meeting, I am going to recommend that the Clayton facility be closed.

Required:

1. From the standpoint of the company as a whole, should the Clayton processing center be shut down and its work redistributed to other processing centers in the region? Explain.
2. Do you think Haley Romeros's decision to shut down the Clayton facility is ethical? Explain.
3. What influence should the depreciation on the facilities at Clayton have on prices charged by Clayton for its services?

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INDEX

Page numbers followed by n refer to footnotes.

A

- Aanonsen/Hodges, Jill, 204
Abbott Laboratories, 21
ABC. *See* Activity-based costing (ABC)
Absenteeism, 85
Absorption costing, 76
Accenture, 33, 524
Account analysis, 210
Accounts receivable turnover ratio, 660, 664
Accumulated depreciation, 615
Acid-test (quick) ratio, 659–660, 664
Activity
 activity measures, 128, 216–217
 activity variances in flexible budget, 365–366
 definition of, 127
 as independent variable, 213
 scattergraph plots and, 213–220
Activity base, definition of, 199
Activity-based costing, 464
Activity-based costing (ABC)
 activity hierarchies, 131
 activity rate computation, 135
 application of, 133–134
 benefits of, 125, 140
 cost flows in, 143–146
 costs of implementation of, 141
 direct labor-hours as base, 134–135
 example of, 132–133
 job-costing compared with, 85
 limitations of, 141
 modification of ABC model, 141–142
 overhead cost assignment and, 127–129
 overhead cost shifts and, 137–138
 predetermined overhead rate and, 134
 product cost computation, 135
 service industries, 142–143
 system design, 129–133
Activity-based management, 138–139
Activity cost pool, definition of, 128
Activity dictionary, 129
Activity measures, 128, 216–217
Activity rates, definition of, 128–129
Adelphia Communications Corporation, 12, 610
Administrative costs. *See* Selling and administrative costs
After-tax cash flows, 567
After-tax cost of long-term debt, 567
Airbus, 33, 275, 522
Airco Heating and Air Conditioning (Airco), 139
Al-Rifai, Mohammad Hani, 139
Alcoa, 611
Alger, Mike, 528
Allocation base, 82
Almanac of Business and Industrial Financial Ratios, 665
AMA Annual Statement Studies, 665
Amazon.com, 269, 280–281
Amistad Media Group, 317
Amortization, 615, 619
Anderson, Mark C., 202
Anderson, Steven R., 133
Apple, 453
Arkansas, 139
Arnold, Glen C., 576
Astley, Mary F., 334
Astore, Guiliano, 78
Australia, 602
Austria, 48
Average collection period, 660, 664
Average common stockholders' equity, 655
Average sale period ratio, 661, 664
Avery Dennison, 529
Avoidable costs, 510
- ## B
- Bagranoff, Nancy A., 12
Balance sheet
 budgeted balance sheet, 332–333
 overview of, 38–39
 product costs and, 43–44
Balanced scorecard
 characteristics of, 480–482
 company strategy and, 482–484
 corporate governance and, 485
 customer perspective, 481
 definition of, 479
 internal business processes perspective, 481
 learning and growth perspective, 481
 performance measures, 480, 481
Balanced Scorecard Collaborative, 479
Bank of America, 18, 19, 29
Bank of Tokyo-Mitsubishi UFJ, 484
Banker, Rajiv D., 202, 414
Barnett, Donald F., 198
Barr, Paul, 372
Bartoli, J., 86
Batch-level activities, 130, 131
Bausch & Lomb, 476
Baxter International, 21
Bays, Brad, 169
Beatty, Sally, 37
Bechtel International, 77, 469–470
Bed Bath & Beyond, 455
Bell, Jim, 310
Benchmarking, 139
Berner, Robert, 282
Best Buy, 476, 484, 558
Bethlehem Steel, 529
Beverage Can Americas Co., 485
Bible, Lynn, 619n
Bicycling vacations, 78
Binney & Smith, 529
Black and Decker, 200
Blocher, Edward, 129
Blockbuster Video, 46
Bloomberg, Michael, 309
Blue Nile, 5
BMW, 4, 482
Body Shop, 482
Boeing, 77, 275, 522, 523, 529
Böer, Germain, 33, 35, 517
Boesen, Thomas, 313
Boise Cascade, 476
Bombardier Learjet, 34
Bombardier of Canada, 555
Bonuses, 312–313
Book value per share, 656–657, 664
Boorstin, Julia, 472
Borealis, 313
Bottlenecks, 10, 527
Boyle, Matthew, 50, 558
Brazil, 2, 402
Break-even point
 break-even analysis, 273–275
 definition of, 260
 example of, 257
 sales mix and, 283
Brewer, Peter C., 12, 142
Brigham & Women's Hospital, 484
British Columbia, 202
Britvic, 10
Brodsky, Norm, 461
Brooker, Katrina, 314
Broom, Glen, 20
Broome, E. Whitfield, 610
Buck Knives, 559
Budgetary slack, 310
Budgeted balance sheet, 332–333
Budgeted income statement, 331
Budgets and budgeting. *See also* Master budget
 advantages of, 308
 budget committees, 313–314
 budget period, 309–310
 budget preparation, 29
 budgetary slack, 310
 budgeted balance sheet, 332–333
 budgeted income statement, 331
 continuous budgets, 309–310
 control and, 308–309
 definition of, 29, 308
 flow of budget data, 310–311
 human factors, 311–313
 operating budgets, 309
 performance pressures and, 312–313
 perpetual budgets, 309–310
 planning and, 308, 360
 purpose of, 308, 312–313
 self-imposed budgets, 310–311
 selling and administrative costs budget and, 314
 variances, 364–370
Budgets for manufacturing costs, 314
Bulkeley, William M., 654
Burlingham, Bo, 398

- Burlington Northern Santa Fe (BNSF), 328
 Burrook, Rick, 645
 Burton-Houle, Tracey, 11
 Business process, definition of, 7
 Buy or lease decisions, 554
 Buy or make decisions, 521–523
 Byrnes, Nanette, 18, 455
- C**
- Caggiano, Christopher, 206
 Calabro, Lori, 36, 485
 Calagione, Sam, 276, 277
 California, 140, 559, 608
 Calvin Klein, 127
 Campbell Soup, 49–50
 Canada, 2, 3, 528
 Cannella, Cara, 282
 Canon Inc., 326
 Capital budgeting, definition of, 554
 Capital budgeting decisions. *See also* Decision making
 cost reduction decisions, 554
 discounting cash flows and, 555
 equipment selection decisions, 554
 example of, 553
 expansion decisions, 554
 incremental-cost approach, 562–564
 internal rate of return method, 567, 575
 investment planning, 554–555
 lease or buy decisions, 554
 least-cost decisions, 563–564
 net present value method and, 555–564, 567, 575
 payback method, 568–572, 575
 postaudit, 575
 preference decisions, 555, 565–566
 return on investment and, 557
 screening decisions, 554–555
 simple rate of return method and, 572–573, 575
 time value of money and, 555
 total-cost approach, 561–562
 Carey, Susan, 279
 Carmichael, Paul, 553
 Cash, definition of, 603
 Cash budget, 314, 327–330
 Cash equivalents, definition of, 603
 Cash flows. *See also* Statement of cash flows
 after-tax cash flows, 567
 capital budgeting decisions and, 555, 557–558
 discounting cash flows, 555
 fraud and, 610
 free cash flow, 619–620
 investors and, 604
 master budget and, 315–317
 payback method and, 572
 understanding cash flows, 601
 Caterpillar, 21
 Cells, 9
 Celtics, 557
 Cemex SA, 177
 Center, Allen, 20
 CEOs, 511
 Certified Management Accountant (CMA), 23
 Cessna Aircraft Company, 522
 Champion International, 529
 Charles DeGaulle airport, 465
 Charlup, Jerry, 330–331
 Chatzky, Jean, 568
 Cheney, Glenn, 663
 Chief executive officers (CEOs), 18–19
 Chief financial officers (CFOs), 6–7, 16, 18–19
 Chiletra, 484
 China, 2, 3, 34, 174, 206, 402, 456
 China Resources Microelectronics, 484
 Chrysler, 85–86
 Cincinnati/Northern Kentucky International Airport (CNK), 270
 Cintas Corporation, 553
 Cisco Systems, 4
 Citizen Schools, 37
 Clearing accounts, 92
 Clement, Ronald W., 22
 Club Med, 130
 Coca-Cola Company, 16, 28, 171, 476
 Code of Ethics for Professional Accountants (IFAC), 17–18
 Codes of conduct, 14–18
 Colorado, 569, 609
 Columbia Pictures, 102
 Committed fixed costs, 203, 208
 Common fixed costs, 463
 Common-size financial statements, 650–652
 Competition, globalization and, 4
 Constrained resource utilization
 constraint management, 528–529
 contribution margin per unit, 527–528
 overview of, 526–527
 relaxing (elevating) constraints, 528–529
 software for, 528
 Constraint, definition of, 526
Consumer Reports, 564
 Continuous budgets, 309–310
 Continuous process manufacturing, 77
 Contribution income statement, 222–223, 259–260, 284
 Contribution margin, 222, 259–261
 Contribution margin ratio (CM ratio), 264–269
 Control function, 29, 308–309
 Controllers, 7, 29
 Controlling, 28, 29–30
 Convention centers, 509
 Conversion costs, 36–37, 177, 178
 Cook County General Hospital, 211
 Corkery, Michael, 662
 Corporate culture, 16
 Corporate governance, 18, 485
 Corporate social responsibility, overview of, 21–22
 Cost analysis, 518–521
 Cost behavior
 cost structure, 198
 definition of, 45
 fixed costs, 46–49, 203–207
 high-low method, 217–220
 income statement and, 222–223
 least-squares regression method and, 218, 220–222
 mixed costs, 209–212, 218
 pattern types, 198–210
 scattergraph plots, 213–220
 variable costs, 45–47, 198–203, 213–220, 222
 Cost centers, 371, 455–457
 Cost classifications
 administrative costs, 35–37
 conversion costs, 36–37
 cost behavior prediction and, 45–49
 cost objects, 49–50
 decision making and, 50–52
 differential costs, 50
 direct costs, 49
 financial statements and, 38–42
 incremental costs, 51
 indirect costs, 49–50
 manufacturing costs, 33–35, 37
 nonmanufacturing costs, 35, 37
 opportunity costs, 51–52
 overview of, 33
 period costs, 36
 prime costs, 36–37
 product costs, 35–36
 selling costs, 35–37
 sunk costs, 52
 Cost drivers, 84–85, 199, 371
 Cost flows
 activity-based costing system, 143–145
 job-order costing, 87–97
 process costing, 171–175
 product cost flows, 42–45
 T-account model, 100–101
 Cost objects, definition of, 49
 Cost of capital, 559
 Cost of goods manufactured, 41–42, 93, 97
 Cost of goods sold, 39, 41, 94, 97
 Cost reduction decisions, 554
 Cost structure, definition of, 198
 Cost-volume-profit (CVP) analysis
 applications of, 267–271
 assumptions of, 205
 break-even point and, 257, 260, 273–275
 contribution margin and, 259–261, 264–269
 cost structure choice, 277–279
 equation form, 261–262, 271
 factors in, 258
 formula method, 271–272
 graphic form, 262–264
 incremental analysis, 268
 margin of safety and, 275–277
 operating leverage and, 279–281
 overview of, 258–259
 profit stability and, 277–279
 sales commission structure, 281–282
 sales mix and, 282–283
 target profit analysis, 271–273
 variable expense ratio and, 267
 Cost-volume-profit (CVP) graph, 262
 Costco, 10
 Cox, Jeff, 413n
 Crandall, Robert W., 198
 Credit Suisse, 476
 Crest, 464
 Creswell, Julie, 482
 Crown Castle International, 484
 Current ratio, 659
 Curtin, Margaret, 517
 Customer intimacy, 4
 Customer service, 514

- Customer value propositions, 4, 9
 Cutlip, Scott, 20
 CVP. *See headings beginning*
Cost-volume-profit (CVP)
- D**
- Dadas, Nick, 75
 D'Arcier, Constance Faivre, 82
 Data relevance, 31
 Debt-to-equity ratio, 662, 664
 Decentralization
 advantages of, 454–455
 cost assignment, 468–470
 cost centers, 455–457
 decision making and, 454n
 disadvantages of, 454–455
 overview of, 5
 performance evaluation and, 456, 470–475
 residual income and, 475–479
 responsibility accounting and, 455–457
 return on investment (ROI) and, 470–475
 segment reporting and, 457–467
 Decision making. *See also* Capital budgeting decisions
 adding/dropping segments, 518–521
 avoidable costs and, 510
 constrained resource utilization and, 526–530
 cost analysis, 518–521
 cost classifications and, 50–52
 customer service, 514
 differential costs and, 511, 514–516
 environmental issues, 516–517
 fixed costs and, 205–206
 make or buy decisions, 521–523
 managerial accounting functions and, 31
 opportunity costs and, 524–526
 outsourcing, 514, 523–524
 performance evaluation and, 454n
 relevant costs and, 510, 510–516
 shareholders and, 454n
 special orders, 525–526
 sunk costs and, 510–511
 Decremental costs, definition of, 50
 Defects, 8, 9, 11
 Degree of operating leverage, 279
 Delattre, Allen J., 425
 Dell Inc., 399, 514, 523
 Delta Airlines, 270, 602
 Delta Dental of Kansas, 484
 Delta Petroleum Corporation, 609
 DeMeyer, A., 35
 DeMolina, Alvaro, 19
 Demos, Telis, 19
 Denmark, 313
 Departmental overhead rates, 127
 Dependent variables, 213–220
 Depletion, 619
 Depreciation, 615, 619, 649
 Der Hovanesian, Mara, 604
 Devaraj, Sarv, 414
 Deye, Donna, 359
 Differential costs, 50, 511, 514–516
 Differential revenue, definition of, 51
 Dimmick, Christine, 330–331
 Direct costs, definition of, 49
 Direct exchange transactions, 610n
 Direct labor
 ABC and, 134
 balance sheet and, 43–44
 cost measures, 80–81
 definition of, 34
 efficiency variances, 419
 labor rate variances, 412–413
 as manufacturing cost, 34, 37, 397
 standard costs and, 412–414
 standard hours per unit, 404
 standard rate per hour, 403, 404
 Direct labor budget, 322–323
 Direct labor hours (DLH), 82, 199, 323
 Direct materials
 definition of, 33
 job-order costing and, 79–80
 as manufacturing cost, 33–34, 37, 397
 price variances, 409–410
 quantity variances and, 397, 410–411
 raw materials, 33
 standard costs and, 406–411
 standard price per unit, 403
 standard quantity per unit, 403
 as true variable cost, 202
 as variable cost, 45
 variance analysis, 406–411
 Direct materials budget, 320–322
 Direct materials standards, 403
 Direct method, 611
 Directing and motivating, 28, 29
 Discount rate, 559
 Discounting cash flows, 555
 Discretionary fixed costs, 203–204, 208
 Disney Corporation, 33, 463
 Disney World, 463
 Dividend payout ratio, 653–654, 657, 664
 Dividend yield ratio, 657, 664
 Division segments, 462
 DMAIC (Define, Measure, Analyze, Improve, and Control), 11–12
 Dogfish Head Craft Brewery, 276, 277
 Downsizing, 207
 Drexler, Mickey, 472
 Drucker, Peter F., 371
 Dun and Bradstreet, 476
 DuPont, 33, 472
 Durfee, Don, 16
 Dutta, Soumitra, 398n
 Dynergy, 610
- E**
- Earnings per share, 652–653, 664
 eBay, 280–281, 568, 652
 Economic impact studies, 509
 Economic value added (EVA), 476
 EDGAR database, 663, 665
 EDGAR Online, Inc., 665
 Edmondson, Gail, 18, 82
 Edwards, Andrew, 653
 Edwards, Cliff, 49
 Egger, Stefan, 48
 E.I. du Pont de Nemours and Company, 472
 Elgin, Ben, 467, 567
 Eli Lilly and Company, 21, 476, 523
 Emore, James R., 469
 Ending finished goods inventory budget, 325–326
 Energy efficiency, 569–570
 Engineering approach to cost analysis, 211
 Enron, 12, 13, 18, 485, 620
 Enterprise risk management, 20
 Environmental impact decisions, 567, 569
 Equation form of CVP analysis, 261–262, 271
 Equipment selection decisions, 554
 Equivalent units of production, 176–181
 Ernst & Young, 22
 Ethan Allen, 33
 Ethics
 codes of conduct, 14–18
 corporate culture and, 16
 importance of, 12–14
 reputation and, 13
 trust and, 13
 eToys, 274
 Excel, 331, 334
 Expansion decisions, 554
 Expedia, 280–281
 Extensible Business Reporting Language (XBRL), 663
 Extensible Markup Language (XML), 663
- F**
- Facility-level activities, 130, 131
 Fairlamb, David, 18
 Federal Express, 399
 Federated Mogul, 476
 FedEx, 2, 4, 567
 Feedback, 29
 FIFO method, 176
 Financial accounting, 30–33
 Financial Accounting Standards Board (FASB), 467, 608, 609, 611, 613, 615
 Financial leverage, 655–656
 Financial statements. *See also specific types of statements*
 book value per share, 656–657
 common-size financial statements, 650–652
 comparative form, 626–649
 dividend payout ratio, 653–654
 earnings per share, 652–653
 financial leverage, 655–656
 GAAP and, 649
 gross margin percentage, 651
 horizontal analysis, 647–649
 price-earnings ratio, 653
 purpose of, 646
 ratios and, 646, 652–656
 return on common stockholders' equity, 655
 return on total assets ratio, 654–655
 trend analysis, 647–649
 vertical analysis, 650–652
 yield ratios, 653–654
 Financing activities, 608–610
 Finished goods, 8, 38
 Fink, Ronald, 312
 First Boston, 476
 First Commonwealth Financial Corporation, 485

- Fixed costs
 adding/dropping segments and, 520–521
 committed fixed costs, 203, 208
 common fixed costs, 463
 discretionary fixed costs, 203–204, 208
 examples of, 48
 fixed cost behavior, 46–49, 203–207
 flexible budgets and, 373
 labor as, 207
 manufacturing overhead budget and, 324
 relevant range and, 48–49, 208–209
 traceable fixed costs, 463, 465, 468–469
 types of, 203–206
- Flexible budgets
 applications of, 363–364
 cost drivers, 371
 definition of, 360
 fixed costs and, 373
 flexible budget variances, 363–370
 performance reports and, 370–371
 static planning budget and, 361–363
 variable costs and, 373
- Florida, 662
 Florida Power and Light, 200
 Flynn, David, 317
 Fonfeder, Robert, 649
 Ford Motor Company, 33, 200, 529
 Forecaster, 334
 Foreign currency exchange, 34
 Forelle, Charles, 102
 Formula methods of CVP analysis, 271–272
 France, 207
 Franklin, GERALYN McClure, 530
 Fraser, Jill Andresky, 645
 Fraud
 cash flows and, 610
 CFOs and, 16
 Enron and, 18
 GAAP and, 32
 Parmalat and, 18
 Free cash flow, 619–620
FreeEdgar, 665
 Fuel costs, 47
 Fujio Mitarai, 326
- G**
- The Gap, 33
 Gemological Institute of America, 5
 Genentech, 21
 General Electric, 11
 General Motors (GM), 45, 283, 456, 463, 529
 Generally Accepted Accounting Principles (GAAP), 31, 32, 467, 649
 Georgia-Pacific, 476
 Gerdau Acominas, 484
 Germany, 3, 207
 Gillette, 314
 Global Crossing, 12
 Globalization, 2, 3, 4
 GM (General Motors), 45
 Goff, John, 334
 Gold, Harry, 197
 Gold, Russell, 609
 Goldratt, Eliyahu M., 413n
 Good Home Co., 330–331
- Google, 199, 467
 Goranson, Craig A., 334
 GORE-TEX, 4
 Graphic form of CVP analysis, 262–264
 Gross domestic product, 21
 Gross margin percentage ratio, 651, 664
 Guidant Corporation, 476
 Gulfstream V, 511
 Gunther, Marc, 453
- H**
- H & R Block, 206
 Haddad, Charles, 47
 Haddad, Joe, 75
 Hallmark, 77
 Han Dan Iron and Steel Company, 456
 Hannon, Neal, 663
 Harlem Children's Zone, 37
 Harvard Medical School Hospital, 210
 Hatzopoulos, Panos D., 576
 HealthSouth, 12
 Hempel, Jessi, 85
 Hendrick Motorsports, 334
 Hershey Foods, 476
 High-low method, 217–220
 Hilton Hotels, 484
 Hodges, David, 204
 Hof, Robert D., 281
 Holtzman, Mark P., 649
 Home Depot, 455
 Honda, 85
Hoover's Online, 665
 Horizontal analysis of financial statements, 647–649
 Hospitals, 372
 Hoyt, Louis, 517
 Huang, Patricia, 276, 277
 Huguet, Jim, 620
 Hunstman Corp., 310
 Hunt, Tom, 328
 Husky Injection Molding, 476
 Hyatt Corporation, 454
 Hybrid vehicles, 567
- I**
- Ibex Outdoor Clothing, 608
 IBM, 102, 326, 654
 Idaho, 559
 Ideal standards, 401
 IDEX Great Companies mutual fund, 620
 iExplore.com, 199
 Income statement
 budgeted income statement, 331
 contribution income statement, 222–223, 259–260, 284
 cost classifications and, 39–41
 job-order costing and, 97
 segmented income statement, 458–462, 465
 selling and administrative costs and, 43–44
 Income taxes, 567
 Incremental analysis, 268
 Incremental-cost approach, 562–564
 Incremental costs, definition of, 50
 Incremental investments, 570
 Indalex Aluminum Solutions Group, 528
- India, 2, 34
 Indirect costs, 34, 49–50, 82
 Indirect labor, 34, 80
 Indirect method, 611
Industry Norms & Key Business Ratios, 665
 Information Technology (IT) Department, 359
 Ingersoll Rand, 484
 Insteel Industries, 125
 Institute of Management Accountants (IMA), 14–16, 27
 Intel, 49
 Internal control reports, 19
 Internal rate of return method, 567, 575
 International Federation of Accountants (IFAC), 17–18
 International Financial Reporting Standards (IFRS), 32
 Internet, 2, 5
 Internet sales, 273
 Inventoriable costs, 35, 43
 Inventory, 39, 40, 43
 Inventory turnover ratio, 660–661, 664
 Investing activities, 608, 609
 Investment centers, 456
 Ipswitch, Inc., 574
 Iselin, Errol R., 602
 Italy, 18
 ITT, 529
 Ittner, Christopher, 484
 Iverson, Kenneth, 198
- J**
- J. Crew, 472
 Jackson Hole Llamas, 204
 Jaguar, 482–483
 Janakiraman, Surya N., 202
 Japan, 2, 3, 207
 J.C. Penney, 476
 Jensen, Michael C., 313
 JetBlue, 279
 Jeter, Debra, 33, 35
 JIT (just-in-time production), 9
 J.K. Gill, 200
 Job cost sheet, 80
 Job-order costing
 absorption costing, 76
 clearing accounts and, 92
 continuous process manufacturing compared with, 77
 cost flows, 87–97
 cost of goods manufactured, 93
 cost of goods sold, 94
 direct labor cost measures, 80–81
 direct materials cost, 79–80
 document flows, 86–88
 job cost sheet, 80
 labor costs, 89–90
 manufacturing overhead application, 82–84
 nonmanufacturing costs and, 92–93
 overview of, 76–87
 predetermined overhead rates and, 102
 process costing and, 76, 170–171
 service companies and, 102
 unit costs, 86
- JobBound, 207

Johnson & Johnson, 16, 20, 21
 Jones, Daniel T., 9
 Journal entries, 95
 Jun-Lin, Z., 456
 Just-in-time production (JIT), 9

K

Kafka, Peter, 275
 Kahn, Jeremy, 16
 Kansas, 317
 Kansas City Power & Light, 476
 Kaplan, Robert S., 133, 485
 Kaplan, Tamara, 20
 Karafil, Brad, 211, 524–525, 555
 Karafil, Carole, 211, 524–525, 555
 Karpoff, Jonathan, 13, 14
 Karsh, Brad, 207
 Kaufman and Broad, 34
 Kelly, Erin, 274
 Kemps I.L.C., 133
 Kentucky Fried Chicken, 33
 Keough, Don, 16
 Kestrel Management Services, LLC, 571
 Key Corp., 484
 Kilts, Jim, 314
 Kirkpatrick, David, 514
 Knight, Joe, 398
 Kohl's, 282
 Korea East-West Power, 484
 KPMG, 21
 Kroger, 206, 463
 Kroll, Karen N., 574
 Kunes, Thomas P., 571

L

Labor, 46, 207
 Labor cost reduction, 34
 Labor efficiency variance, 413–414
 Lampe, Scott, 334
 Landing fees, 465
 Larcker, David F., 484
 LaSorda, Thomas, 85
 Lean production, 7–10
 Lean thinking model, 8–9
 Leap, Terry, 22
 Lease or buy decisions, 554
 Least-cost decisions, 563–564
 Least-squares regression method, 218, 220–222
 Lee, Louise, 326, 466
 Lehman Brothers, 283
 Leibs, Scott, 485
 Lenk, Toby, 274
 Levi Strauss, 77
Lilo & Stitch, 307
 Line positions, 6
 Linear, 213–220
Lion King, 307
 Long-term creditors, 661–662
 Long-term debt, 567
 Loughry, Misty L., 22
 Lovins, Amory, 569
 Lowry, Tom, 309
 LSG SkyChefs, 77
 Lunsford, J. Lynn, 522

Lustgarten, Abraham, 21
 Luxfer Gas Cylinders, 484
 Lydgate, Chris, 559
 Lyons, John, 177

M

Machine-hours (MH), 82
 Macy's Department Stores, 610
 Majestic Ocean Kayaking, 202
 Make or buy decisions, 521–523
 Managed fixed costs, 205
 Management accounting
 financial accounting compared with, 30–33
 functions of, 27
 planning and, 29–30
 standards and, 399
 as voluntary, 31–33
 Management by exception, 399–401, 417–418, 419
 Mangalindan, Mylene, 652
 Manufacturing cells, 9
 Manufacturing costs
 budgets for, 314
 direct labor, 34, 80–81
 direct materials, 33–34, 45, 79–80
 indirect costs, 34
 indirect labor, 34, 80
 manufacturing overhead, 34–35
 raw materials, 33, 38
 Manufacturing overhead
 allocation base and, 84–85
 application of overhead in job-costing, 82–84
 balance sheet and, 43
 cost classification of, 37
 definition of, 34–35
 job-order costing and, 90–91, 98–100
 variable manufacturing overhead standards, 405, 406, 414–417
 Manufacturing overhead budget, 323–324
 Manzoni, Jean-François, 398n
 Maremont, Mark, 511
 Margin, 472
 Margin of safety, 275–277
 Marginal costs, definition of, 50
 Marginal revenue, definition of, 50
 Marriott Vacation Club International, 484
 Mason, Richard, 619n
 Massachusetts, 282
 Master budget
 budgeted balance sheet, 332–333
 budgeted income statement, 331
 budgets for manufacturing costs and, 314
 cash budget and, 314, 327–330
 cash flow and, 315–317
 direct labor budget, 322–323
 direct materials budget and, 320–322
 ending finished goods inventory budget and, 325–326
 fixed costs and, 324
 interrelationships in, 314–315
 manufacturing overhead budget and, 323–324
 merchandise purchases budget and, 320
 overview of, 314–315
 production budget and, 314, 318–320

sales budget and, 314, 317–318
 selling and administrative costs budget and, 314, 326–327
 variable costs and, 323–324
 Material handling, 129
 Materials price variance, 409
 Materials quantity variance, 410–411
 Materials requisition forms, 79
 Matlack, Carol, 455, 458
 Matthews, Robert Guy, 402
 Maxwell, Jill Hecht, 85
 Mayer, Marissa, 467
 Mayo Clinic, 47
 McCuddy, Michael K., 16
 McDonald's Corporation, 2, 7, 50, 419, 648, 656
 McDonald's France, 474–475
 McKendrick, Joseph, 137
 McKinsey, 33
 McKittrick, Christopher, 129
 Menino, Thomas M., 557
 Merchandise purchases budget, 320
 Meredith, Robyn, 410
Mergent Industrial Manual and Mergent Bank and Finance Manual, 665
 Meridien Research, 137
 Metro de Madrid, 484
 Mexico, 2, 3
 Miami University, 75
 Michaels, David, 275
 Michigan, 174
 Microsoft, 21, 453
 Microsoft Excel, 331, 334
 Miller, J., 35
 Mills, John, 619n
 Minnesota, 133
 Mission Controls, 206
 Mixed costs, 209–212, 218
 Mobistar, 484
 Moersch, Brian J., 530
 Monster Cable, 529
 Morben-Eeftink, Tracy, 202
 Motivation, 477–478
 Motorola, 11, 523
 Mullaney, Timothy J., 281
 Muller, Joann, 86
 Multiple predetermined overhead rates, 102
 Murphy, Victoria, 5, 509
 Myers, Randy, 328

N

Naaw, Daniel, 207
 Nachtmann, Heather, 139
 NAFTA. *See* North American Free Trade Agreement (NAFTA)
 Nagel, Michael, 485
 Nakane, J., 35
 Nalley's, 171
 Narayanan, V. G., 125
 NASCAR, 334
 Nasdaq 100, 649
 National City Bank, 21
 National Federation of Coffee Growers of Colombia, 484
 National Geographic, 199
 National Health Service (NHS), 10

- National Oceanic and Atmospheric Administration, 21
 National Semiconductor, 529
 Nebraska, 317
 Needleman, Sarah F., 22
 Negative net present value, 559
 Neiman Marcus, 51
 Ness, Joseph A., 469
 Nestle, 455
 Net cash provided by operating activities, 611
 Net operating income, 471
 Net present value, definition of, 555
 Net present value method
 cash flows and, 557–558
 cost of capital and, 559
 discount rate choices and, 559
 extended example of, 560–561
 frequency of application of, 575
 income taxes and, 567
 incremental-cost approach, 562–564
 negative net present value, 559
 overview of, 555–558
 positive net present value, 559
 total-cost approach and, 561–562
 working capital and, 558
 New York, 309, 568
 Nike, 2
 Nokia, 453
 Non-value-added activities, 12
 Nongovernmental organizations (NGOs), 22
 Nonmanufacturing costs, 35, 92–93
 Nonprofit organizations, 370
 Nordstrom, Inc., 4, 33, 127, 330, 558, 606–607, 614–619
 Noreen, Eric, 141, 142
 Normal cost system, 83
 North American Free Trade Agreement (NAFTA), 2
 North Carolina, 317, 360
 Novamex, 317
 Nucor Corporation, 360
 Nucor Steel, 198
- O**
- Obsolescence costs, 34
 Odessa Police Department (Texas), 530
 “Offshoring” jobs, 34
 O’Hanlon, John, 476
 Ohio, 553
 Olin, 476
 OMG Center for Collaborative Learning, 374
 Operating activities, 608–609, 611
 Operating assets, 471
 Operating budgets, 309
 Operating leverage, 279–281
 Operational excellence, 4
 Opportunity costs, 51–52, 524–526
 Oregon, 509
 Organization charts, 5–7
 Organization structure, 5–7
 Orwall, Bruce, 307
 Oscar Mayer, 76
 Outsourcing, 514, 523–524
 Overapplied overhead, 98–100
 Overhead, Internet and, 5
- Overhead cost assignment
 activity-based costing (ABC) and, 127–129
 departmental overhead rates, 127
 in job-costing, 82–84
 overhead cost shifts, 137–138
 plantwide overhead rates, 126–127
 process costing and, 173–174
 Owens & Minor, 140
- P**
- Pacific Northwest National Laboratory, 334
 Paladino, Robert E., 479
 Panasonic, 33
 Paramount, 33
 Park Place Entertainment, 85
 Parmalat, 18
 Parsons Brinckerhoff (PB), 469–470
 Participative budgets, definition of, 310
 Payback method, 568–572, 575
 Peace Corps, 28
 Pearlman, Russell, 620
 Peasnell, Ken, 476
 Penn State University, 653
 PepsiCo, 463
 Per unit costs, 203
 Performance measures and reporting
 balanced scorecard, 479, 485
 company strategy and, 399
 decision making and, 454n
 definition of, 29
 feedback, 485
 flexible budgets and, 370–371, 398–399
 purpose of, 398
 residual income and, 475–479
 return on investment (ROI) and, 470–475
 Period costs, overview of, 36
 Perpetual budgets, 309–310
 Personal digital assistant (PDA), 523
 Personnel Department, 29
 Petersen, Steve, 398
 Petroleum coke, 177
 Phase 2 Consulting, 372
 Pilcher, James, 270
 Pizza Hut, 33
 Planalytics, 21
 Planned activities, 208
 Planning, 29–31, 33, 308
 Planning and control cycle, 30
 Planning budgets, definition of, 360
 Plantwide overhead rates, 102, 126–127
 Positive net present value, 559
 Postaudit, 575
 Practical standards, 401
 Pratt, Jonathan, 568
 Pratt and Whitney Canada, 529
 Predetermined overhead rate, 82–84, 92, 102, 134
 Preference decisions, 555, 565–566
 Pressure, 312
 Pretoria Academic Hospital, 529
 Price-earnings ratio, 653, 664
 Price standards, definition of, 399
 Price variances, 405
 Prime costs, 36–37
 Pro forma earnings reports, 649
- Process costing, 76, 170
 Process costing system
 cost flows, 171–175
 cost reconciliation report, 180–181
 equivalent units of production, 176–181
 example of, 169
 job-order costing compared with, 170–171
 materials costs, 173
 overhead costs, 173–174
 production process illustration, 175
 T-account model of, 172
 weighted-average method and, 176–177, 179–181
 Process management, 7–11
 Processing department, 171–172, 173
 Procter & Gamble (P&G), 10, 21, 169, 523, 529
 Product costs
 overview of, 35–36
 product cost computation, 135
 product cost flows, 42–45
 Product leadership, 4
 Product-level activities, 130, 131
 Product line segments, 462, 518–521
 Product-sustaining activities, 131
 Production budget, 314, 318–320
 Production orders, 79, 127
 Production process illustration, 175
 Productivity, 85
 Professional Marketplace software, 102
 Profit centers, 456
 Profit stability, 277–279
 Project profitability index, 566
 Providence Portland Medical Center (PPMC), 138
 Public Company Accounting Oversight Board, 19
 Pull system, 9
 Push system, 8–9
 pVelocity, Inc., 528
- Q**
- Quaker Oats, 476
 Quantity standards, definition of, 399
 Quigo Technologies, 199
 Qwest Communications International, 45, 610
- R**
- Ratios
 accounts receivable turnover ratio, 660, 664
 acid-test (quick) ratio, 659–660, 664
 average collection period ratio, 660, 664
 average common stockholders’ equity, 655
 average sale period ratio, 661, 664
 book value per share, 656, 664
 contribution margin ratio (CM ratio), 264–269
 current ratio, 659, 664
 debt-to-equity ratio, 662, 664
 dividend payout ratio, 653–654, 657, 664
 dividend yield ratio, 657, 664
 earnings per share, 652, 664
 financial statement data and, 646
 gross margin percentage, 651, 664
 inventory turnover ratio, 660–661, 664
 long-term creditors and, 661–662
 price-earnings ratio, 653, 664

- ratio analysis, 658–662
 - return on common stockholders' equity, 655, 657, 664
 - return on total assets ratio, 654–655, 657, 664
 - short-term creditors and, 658–661
 - times interest earned ratio, 661–662, 664
 - working capital ratio, 658, 664
 - yield ratios, 653–654
 - Raw materials, 8, 33, 38, 43
 - Reason, Tim, 310
 - Reconciliation method, 611
 - Red Cross, 28
 - Red Sox, 557
 - Reichardt, Karl E., 16, 23
 - Reichhold, Inc., 129
 - Relaxing (elevating) constraints, 528–529
 - Relevance, 31
 - Relevant costs
 - definition of, 510
 - identification of, 510–514
 - importance of isolating relevant costs, 516
 - Relevant range
 - definition of, 47, 203
 - fixed costs and, 48–49, 208–209
 - linearity assumption and, 203
 - Renault, 81–82
 - Rent, 47, 76, 204
 - Reputation, 13
 - Research and development, 523–524
 - Residual income, 475–479
 - Responsibility accounting, 308–309, 455–457
 - Responsibility centers, 455
 - Restoration Hardware, 330
 - Retail theft, 41
 - Return on common stockholders' equity, 655, 657, 664
 - Return on investment (ROI), 557
 - criticisms of, 474–475
 - elements of, 473
 - equation, 470, 471, 473–474
 - margin and, 472
 - net operating income and, 471
 - operating assets and, 471
 - performance evaluation and, 456, 470–475
 - turnover and, 472
 - Return on stockholders' equity, 655, 657, 664
 - Return on total assets, 654–655, 657, 664
 - Revell, Janice, 283
 - Revenue segmented by region and customer channel, 459
 - Revenue centers, 455n
 - Revenue variances, 366–370
 - Rexam Pie, 485
 - Reynolds Aluminum, 76
 - Richtermeyer, Sandra B., 7
 - Ricoh Corporation, 484
 - Risk management, 19–21, 334
 - Rite Aid, 12
 - Ritter, Ronald, 34
 - Ritz-Carlton, 4
 - Rocky Mountain Institute, 569
 - Rogers, Bill, 197
 - ROI. *See* Return on investment (ROI)
 - Rolling forecasts, 313
 - Romania, 82
 - Rowley, Ian, 326
 - Royal Canadian Mounted Police, 484
 - Russia, 2
 - Ryan, Glenn P., 576
 - Ryan, Patricia A., 576
- S**
- Safeway, 206, 463
 - Sales budget, 314, 317–318
 - Sales channel segments, 462
 - Sales commissions, 281–282
 - Sales mix, 282–283
 - Sarbanes-Oxley Act of 2002, 18–19, 649
 - Sarkar, R., 125
 - Scattergraph plots, 213–220
 - Schedule of cost of goods manufactured, 41–42
 - Schneider Electric, 397
 - Schoenberger, Chana R., 199
 - Schroeder, David, 16, 23
 - Schroeder, Roger, 414
 - Schumacher, Thomas S., 307
 - Screening decisions, 554–555
 - Screening devices, 559
 - SeaCode, 206
 - Sears, 611
 - Securities and Exchange Commission (SEC), 32, 511, 649, 662, 665
 - Seglin, Jeffrey L., 17
 - Segment, definition of, 457
 - Segment adding/dropping, 518–521
 - Segment margin, 461, 465–467
 - Segment reporting
 - activity-based costing, 464
 - common fixed costs, 463
 - division segments, 462
 - external reporting and, 467
 - Financial Accounting Standards Board (FASB) and, 467
 - GAAP and, 467
 - overview of, 457–458
 - product line segments, 462, 518–521
 - sales channel segments, 462
 - segment margin, 461, 465–467
 - segmented income statement, 458–462, 465
 - traceable fixed costs, 463, 465, 468–469
 - Self-imposed budgets, 310–311
 - Selling and administrative costs
 - budget for, 314, 326–327
 - definition of, 35, 37
 - income statement and, 43–44
 - as period costs, 35, 36
 - Selling, general, and administrative (SG&A) costs, 35
 - Serono, 484
 - Service companies, 102, 142
 - Setpoint, 398
 - 7-Eleven, 28, 33
 - Sharma, Divesh S., 602
 - Sharp, 453
 - Shenyang Aircraft Corporation, 522
 - Shidoni Foundry, 197
 - Shields, Todd, 140
 - Short-term creditors, 658–661
 - Siegel, Gary, 7
 - Silicon Valley Bank, 476
 - Silverman, Rachel Emma, 37
 - Simple rate of return, 572–573, 575
 - Sinha, Kingshuk, 414
 - Six Sigma, 7, 11–12, 420
 - Skippers, 200
 - Smith, Peter T., 334
 - Smith & Hawken, 466
 - Soderstrom, Naomi, 141
 - Sony Corporation, 33, 399, 453
 - Sorensen, James E., 7
 - Southwest Airlines, 4, 21, 210, 399, 479
 - Special orders, 525–526
 - Spending variances, 366–370
 - Sporthotel Theresa, 48
 - Sports4Kids, 37
 - Sprint Nextel, 476, 484
 - Staff positions, 6
 - Standard, definition of, 399
 - Standard & Poor's Industry Survey*, 665
 - Standard cost per unit, 405
 - Standard costs
 - advantages of, 419
 - controls evaluation and, 419
 - definition of, 399
 - direct labor standards, 403–404, 412–414
 - direct materials, and, 403, 406–411
 - ideal standards, 401
 - management by exception and, 399–401
 - manufacturing overhead standards, 405, 414–417
 - potential problems with, 419–420
 - practical standards, 401
 - setting standard costs, 401–405
 - standard hours allowed, 406
 - standard quantity allowed, 406
 - variance analysis, 400, 405–406
 - Standard hours allowed, 406
 - Standard hours per unit, 404
 - Standard Pacific, 662
 - Standard price per unit, 403
 - Standard quantity allowed, 406
 - Standard quantity per unit, 403
 - Standard rate per hour, 403–404
 - Starbucks, 4, 21
 - Statement of cash flows. *See also* Cash flows
 - adjustments to, 614–615
 - basic steps in preparation of, 612–613
 - cash equivalents and, 603
 - classification of entries, 616–617
 - depreciation and, 615, 619
 - FASB and, 608, 609, 611, 613, 615
 - financing activities and, 608–610
 - fraud and, 610
 - free cash flow, 619–620
 - full-fledged statement of cash flows, 608–610, 612–619
 - gross amounts, 610–611
 - interpretation of, 618–619
 - investing activities and, 608, 609
 - net amounts, 610–611
 - noncash balance sheet accounts and, 603–605
 - operating activities and, 608–609, 611
 - overview of, 602
 - simplified statement of cash flows, 605–607
 - Static planning budget, 361–363

Step-variable costs, 201–203, 208
 Stern, Stewart & Co., 476
 Sternfels, Robert, 34
 Stipp, David, 570
 Strategy, 4, 399
 Sunk costs, 52, 510–511
 Supply chain efficiency, 34
 Supply chain management, 10
 Surowiecki, James, 13
 Susan G. Komen Breast Cancer Foundation, 22
 Sutter Health, 140

T

T-account model of cost flows, 100–101
 T-account model of process costing flows, 172
 Taco Bell, 33
 Tahiti, 130
 Tanzi, Calisto, 18
 Target, 282
 Target profit analysis, 271–273
Tarzan, 307
 Tashiro, Hiroko, 326
 Tata Motors, 410
 Taxes, 567
 Taylor, Alex III, 174
 Taylor, Doug, 397
 Taylor, Lloyd J. III, 530
 Tenneco, 174
 Tennessee Valley Authority, 484
 Tesco, 10
 Texas Instruments, 33, 529
 Theft, 41
 Theory of Constraints software, 528
 Theory of Constraints (TOC), 7, 10–11, 138
 Thomson, Jeff, 27
 3M, 21
 Thrive Network, 282
 Tierney, Christine, 47
 Tiffany & Co., 5
 Time tickets, 81, 89
 Time value of money and, 555
 Timeliness, 31
 Times interest earned ratio, 661–662, 664
 Total-cost approach, 561–562
 Totes>>Isotoner Corporation, 359
 Touch labor, 10, 34
 Touse, 662
 Towers Perrin, 312
 Toyota, 34, 76, 399
 Toys “R” Us, 274, 476
 Traceable fixed costs, 463, 465, 468–469
 Tracinda Corporation, 609
 Treacy, Michael, 4
 Tredano, Dominique, 130
 Trend analysis, 647–649
 Trend percentages, 648–649
 Trippetti, Debora, 78
 True variable costs, 201
 Trust, 13
 Tucker, Reed, 206
 Tupperware, 476
 Turnover, 472
 Tyco International, 12, 485, 610

U

Ümani Cafés, 568
 Underapplied overhead, 98–100
 Unions, 198
 Unit-level activities, 130, 131
 Unit product cost formula, 76
 United Airlines, 279, 465, 529
 United Artists, 33
 United Electrical Controls, 529
 United Kingdom, 3, 575
 United Parcel Service (UPS), 47
 U.S. Air Force Logistics Command, 529
 U.S. Army, 317
 U.S. Census Bureau, 3
 U.S. Congress, 18
 U.S. Marine Corps, 138
 U.S. Navy Transportation Corps., 529
 U.S. Postal Service, 476, 484
 U.S. Transportation Department, 270
 University of Dayton, 75
 University of Illinois, 28
 University of Michigan, 85
 University of Virginia, 610
 University Tees, 75

V

Vaillancourt, Meg, 557
 Value chain, definition of, 7
 Vanguard Group, 4
 Vardi, Nathan, 470
 Variable costs
 flexible budgets and, 373
 labor as, 46, 207
 linearity assumption and, 203
 manufacturing overhead budget and, 323–324
 multiple regression analysis and, 222
 relevant range and, 48–49, 203
 scattergraphs plots and, 213–220
 step-variable costs, 201–203, 208
 true variable costs, 201
 variable cost behavior, 45–47, 198–203
 Variable expense ratio, 267
 Variable manufacturing overhead standards, 405
 Variable overhead efficiency variance, 416
 Variable overhead rate variance, 415
 Variance
 activity variances in flexible budget, 365–366
 budgets and budgeting and, 364–370
 definition of, 401
 direct materials variance, 406–411
 flexible budgets and, 363–370
 isolation of, 409
 labor efficiency variance, 413–414, 419
 labor rate variances, 412–413
 price variances, 405–406
 quantity variance, 405–406
 responsibility for, 409–410
 revenue variances, 366–370
 spending variances, 366–370
 standard costs and, 400, 405–406
 variable manufacturing overhead variances, 414–417

variable overhead efficiency variance, 416
 variable overhead rate variance, 406, 415
 Variance analysis
 direct labor variances, 412–414
 direct materials quantity variances, 397, 407, 408
 general model, 405–406
 management by exception and, 417–418
 variance analysis cycle, 400
 VBT Bicycling Vacations, 78
 Vermont, 78, 608
 Vertical analysis of financial statements, 650–652
 Vertical integration, 522
 Victoria Pappas Collection, 461
 Volvo, 482

W

Wal-Mart, 4, 33, 200, 282
 Walker, Rob, 269
 Walt Disney Company, 307, 602
 Waste Management, 482
 WCI Communities, Inc., 662
 Weather conditions, 20–21
 Weighted-average method, 176–177, 179–181
 Wendy's International, 602
 Western River Expeditions, 131
 Weyerhaeuser, 76
 White Grizzly Adventures, 211, 524–525, 555
 W.I. Gore, 4
 Wiersma, Fred, 4
 Wilkes, Mary, 372
 Wing, Kennard T., 374
 Wise Metal Group, 21
 Womack, James P., 9
 Wong, Betty, 129
 Work in process
 definition of, 8
 balance sheet and, 38
 Working capital, definition of, 558
 Working capital ratio, 658, 664
 Workstations, 8
 WorldCom, 12, 485, 610
 Wright, Bill, 140
 www.universitytees.com, 75
 www.vbt.com, 78

X

XBRL (Extensible Business Reporting Language), 663
 XML (Extensible Markup Language), 663

Y

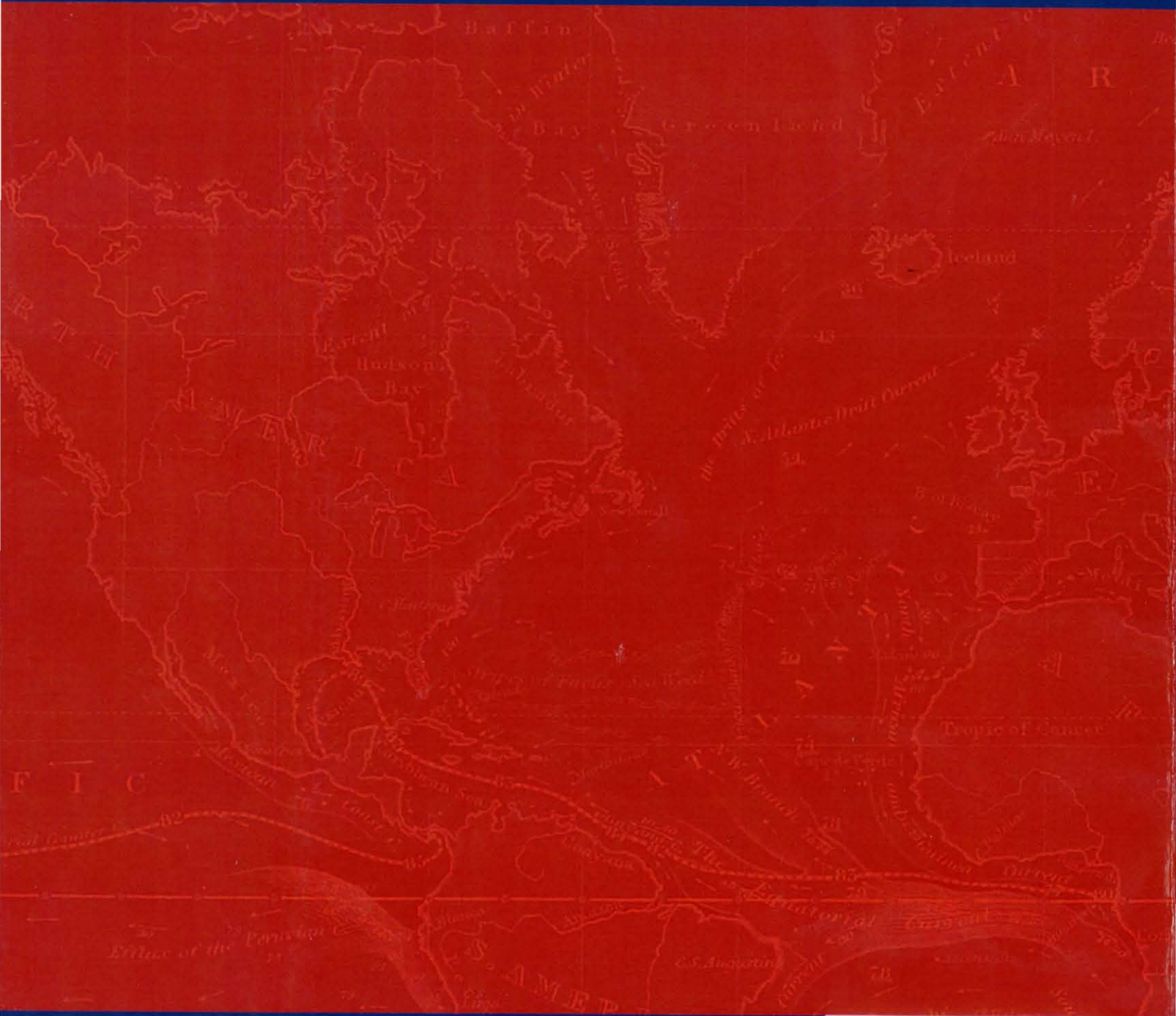
Yahoo, 199
 Yavonditte, Michael, 199
 Yield ratios, 653–654
 Yun, J. K., 649

Z

Zengbiao Yu, 456
 Zero defects, 11



Learning Solutions



ISBN-13: 978-0-07-745935-2
ISBN-10: 0-07-745935-0



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