

COST ACCOUNTING

NINTH EDITION

A MANAGERIAL EMPHASIS

HORNGREN ♦ FOSTER ♦ DATAR



COST ACCOUNTING

PRENTICE HALL SERIES IN ACCOUNTING

Charles T. Horngren, Consulting Editor

Auditing: An Integrated Approach, 7/E ♦ ARENS/LOEBBECKE

Kohler's Dictionary for Accountants, 6/E ♦ COOPER/IJIRI

Financial Statement Analysis, 2/E ♦ FOSTER

Governmental and Nonprofit Accounting: Theory and Practice, 5/E ♦ FREEMAN/SHOULDERS

Financial Accounting, 2/E ♦ HARRISON/HORNGREN

Cost Accounting: A Managerial Emphasis, 9/E ♦ HORNGREN/FOSTER/DATAR

Accounting, 3/E ♦ HORNGREN/HARRISON/ROBINSON

Cases in Financial Reporting ♦ HIRST/MCANALLY

Principles of Financial and Management Accounting:
A Sole Proprietorship Approach ♦ HORNGREN/HARRISON/ROBINSON

Principles of Financial and Management Accounting:
A Corporate Approach ♦ HORNGREN/HARRISON/ROBINSON

Introduction to Financial Accounting, 6/E ♦ HORNGREN/SUNDEM/ELLIOTT

Introduction to Management Accounting, 10/E ♦ HORNGREN/SUNDEM/STRATTON

Budgeting, 5/E ♦ WELSCH/HILTON/GORDON

NINTH EDITION

COST ACCOUNTING

A MANAGERIAL EMPHASIS

Charles T. Horngren

Stanford University

George Foster

Stanford University

Srikant M. Datar

Stanford University



PRENTICE HALL

Upper Saddle River, NJ 07458

Library of Congress Cataloging-in-Publication Data

Hornigren, Charles T., 1926-

Cost accounting: a managerial emphasis / Charles T. Hornigren,
George Foster, Srikant M. Datar. —9th ed.
p. cm. —(Prentice Hall series in accounting)

Includes indexes.

ISBN 0-13-232901-8

I. Cost accounting. 2. Costs, Industrial. I. Foster, George, 1948-

II. Datar, Srikant M. III. Title. IV. Series.

HF5686.C8H59 1996

658.15'4—dc20 96-15750

CIP

Executive Editor: *P.J. Boardman*

Senior Development Editor: *David Cohen*

Associate Editor: *Diane deCastro*

Editorial Assistant: *Jane Avery*

Editor-in-Chief: *Richard Wohl*

Director of Development: *Steve Deitmer*

Executive Marketing Manager: *Deborah Hoffman Emry*

Book Production: *Progressive Publishing Alternatives*

Production Coordinator: *Renee Pelletier*

Managing Editor: *Katherine Evancie*

Senior Manufacturing Supervisor: *Paul Smolenski*

Manufacturing Manager: *Vincent Scelta*

Senior Designer: *Suzanne Behnke*

Design Director: *Patricia Woszczyk*

Interior Design: *Maureen Eide*

Cover Design: *Maureen Eide*

Illustrator (Interior): *TSL Graphics*

Composition: *TSL Graphics*

Cover Art/Photo: *Kunio Ozaki, The Stock Market*



© 1997, 1994, 1991, 1987, 1982, 1977,
1972, 1967, 1962 by Prentice-Hall, Inc.
A Simon & Schuster Company
Upper Saddle River, New Jersey 07458

*All rights reserved. No part of this book may be
reproduced, in any form or by any means,
without permission in writing from the publisher.*

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

ISBN 0-13-232901-8

Prentice-Hall International (UK) Limited, *London*

Prentice-Hall of Australia Pty. Limited, *Sydney*

Prentice-Hall Canada Inc., *Toronto*

Prentice-Hall Hispanoamericana, S.A., *Mexico City*

Prentice-Hall of India Private Limited, *New Delhi*

Prentice-Hall of Japan, Inc., *Tokyo*

Simon & Schuster Asia Pte. Ltd., *Singapore*

Editora Prentice-Hall do Brasil, Ltda., *Rio de Janeiro*

PHOTO CREDITS

page 1 © George Simian page 15 Courtesy Motorola page 25 Andy Sacks/Tony
Stone Images page 41 Stephen A. Hellerstein/The Stock Market page 59 © Flip
Chalfant page 68 Copyright © 1996 General Motors Corporation. All Rights Re-
served. page 93 Jim Felt/Studio 3 page 109 Gottlieb/Monkmeyer Press page 131
Courtesy PPG Industries, Inc. page 149 Courtesy Clark-Hurth Components pages
172-73 Courtesy Dell Computers page 175 Uniphoto page 193 Charles
Gupton/Stock, Boston page 217 Courtesy Bayer AG, Leverkusen, Germany page
231 Courtesy Parker-Hannifin Corporation, Compumotor Division. Photo by Kelley
McMannis page 253 Courtesy Tomkins, PLC, London page 265 © Will Van Over-
beek page 297 Louis Psihoyos/Matrix page 311 © Teri Stratford pages 332-33
Courtesy Ritz-Carlton Hotel Company page 335 Courtesy Regal Marine Industries,
Inc. page 349 Courtesy Caterpillar Inc. page 383 Superstock page 393 Courtesy
Chevron Corporation page 397 Courtesy Intel Corporation page 429 Lincoln Pot-
ter/Gamma-Liaison page 441 Courtesy GE Aircraft Engines Photographic Services
pages 468-69 Courtesy Grand Canyon Railway page 471 Courtesy Pfizer Inc page
476 Collins/Monkmeyer Press page 509 Courtesy Lightworks, London, England
page 522 Courtesy Limousin World, Yukon, Oklahoma page 543 Keith Wood/Tony
Stone Images page 553 Tom Tracy/The Stock Market page 575 Courtesy The Watt
Group, Toronto, Canada page 597 Courtesy Hewlett-Packard Company page 611
Used by permission of Dean Foods Company page 629 Courtesy Coors Ceramics
Company pages 648-49 Courtesy Nally & Gibson Georgetown page 651 Courtesy
Motorola page 666 Courtesy DuPont Corporation page 681 Courtesy Hansford
Automation Systems, Rochester, NY page 690 Courtesy Crysel/CYDSA, Mexico
page 700 John Deere/Uniphoto page 717 Courtesy American Greetings page 727
Courtesy Cutler-Hammer Products, A Division of Eaton Company page 747 Cour-
tesy Harman-Motive Inc. page 757 Courtesy Porsche pages 776-77 Courtesy Ritz-
Carlton Hotel Company page 779 Ziggy Kaluzny/Tony Stone Images page 799
Courtesy Ontario Hydro Archives page 821 Courtesy TRW Inc. page 839 Courtesy
Consumers Power Company pages 862-63 Deer Valley Resort page 865 © John
Williams, Courtesy Ben & Jerry's Ice Cream page 874 Reprinted by permission of
Whirlpool Corporation page 899 Superstock page 916 Saola/Gamma-Liaison
page 931 Superstock page 949 Courtesy The New York Stock Exchange pages
962-69 (1), (2), (4), (5) © Bob Daemmrich; (3), (6) Courtesy Dell Computers

ABOUT THE AUTHORS

CHARLES T. HORNGREN is the Edmund W. Littlefield Professor Emeritus of Accounting at Stanford University. A graduate of Marquette University, he received his MBA from Harvard University and his Ph.D. from the University of Chicago. He is also the recipient of honorary doctorates from Marquette University and DePaul University.

A Certified Public Accountant, Horngren served on the Accounting Principles Board for six years, the Financial Accounting Standards Board Advisory Council for five years, and the Council of the American Institute of Certified Public Accountants for three years. In addition, he served as a trustee of the Financial Accounting Foundation, which oversees the Financial Accounting Standards Board and the Government Accounting Standards Board for six years.

A member of the American Accounting Association, Horngren has also served as its President and Director of Research. He received the Outstanding Accounting Educator Award in 1973, when the association initiated an annual series of such awards.

The California Certified Public Accountants Foundation gave Horngren its Faculty Excellence Award in 1975 and its Distinguished Professor Award in 1983. He is the first person to have received both awards. In 1985, the American Institute of Certified Public Accountants presented him with its first Outstanding Educator Award. Five years later, he was elected to the Accounting Hall of Fame.

In 1993, Horngren was named Accountant of the Year, Education, by the national professional accounting fraternity, Beta Alpha Psi.

Professor Horngren is a member of the National Association of Accountants, and served on its research planning committee for three years. He was also a member of the Board of Regents, Institute of Management Accounting, which administers the Certified Management Accountant examinations.

Charles T. Horngren, the Consulting Editor for the Prentice Hall Series in Accounting, is the coauthor of six other books published by Prentice Hall: *Principles of Financial and Management Accounting: A Sole Proprietorship Approach* and *Principles of Financial and Management Accounting: A Corporate Approach*, 1994 (with Walter T. Harrison, Jr., and Michael A. Robinson); *Introduction to Financial Accounting*, Fifth Edition, 1993 (with Gary L. Sundem and John Elliott), *Introduction to Management Accounting*, Ninth Edition, 1993 (with Gary L. Sundem), *Financial Accounting*, 1992, and *Accounting*, Second Edition, 1993 (with Walter T. Harrison, Jr.).

GEORGE FOSTER is the Paul L. and Phyllis Wattis Professor of Management at Stanford University. He graduated with a university medal from the University of Sydney and has a Ph.D. from Stanford University. He has been awarded honorary doctorates from the University of Ghent, Belgium, and from the University of Vaasa, Finland. He has received the Outstanding Educator Award from the American Accounting Association.

Foster has received the Distinguished Teaching Award at Stanford University and the Faculty Excellence Award from the California Society of Certified Public Accountants. He has been a Visiting Professor to Mexico for the American Accounting Association.

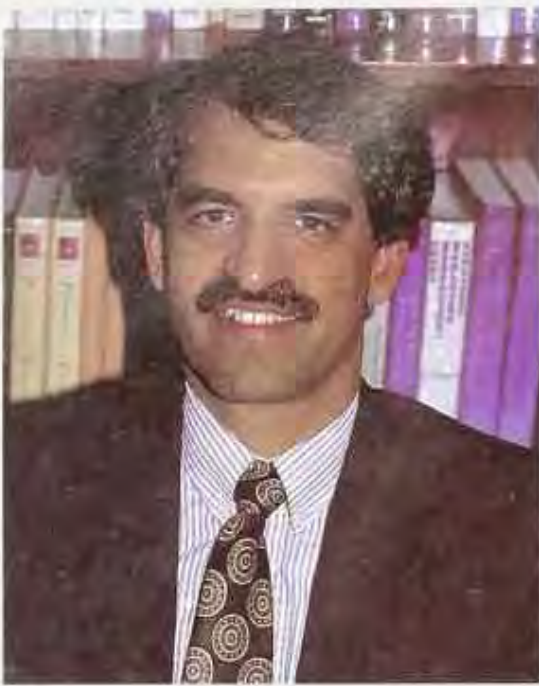
Research awards Foster has received include the Competitive Manuscript Competition Award of the American Accounting Association, the Notable Contri-



bution to Accounting Literature Award of the American Institute of Certified Public Accountants, and the Citation for Meritorious Contribution to Accounting Literature Award of the Australian Society of Accountants.

He is the author of *Financial Statement Analysis*, published by Prentice Hall. He is co-author of *Activity-Based Management Consortium Study (APQC and CAM-I)* and *Marketing, Cost Management and Management Accounting (CAM-I)*. He is also co-author of two monographs published by the American Accounting Association—*Security Analyst Multi-Year Earnings Forecasts and The Capital Market* and *Market Microstructure and Capital Market Information Content Research*. Journals publishing his articles include *Abacus*, *The Accounting Review*, *Harvard Business Review*, *Journal of Accounting and Economics*, *Journal of Accounting Research*, *Journal of Cost Management*, *Journal of Management Accounting Research*, and *Management Accounting*.

Foster works actively with many companies, including Apple Computer, ARCO, BHP, Digital Equipment Corp., Exxon, Frito-Lay Corp., Hewlett-Packard, McDonalds Corp., Octel Communications, PepsiCo, Santa Fe Corp., and Wells Fargo. He also has worked closely with Computer Aided Manufacturing-International (CAM-I) in the development of a framework for modern cost management practices. Foster has presented seminars on new developments in cost accounting in North America, Asia, Australia, and Europe.



SRIKANT M. DATAR is the Edmund W. Littlefield Professor of Accounting and Management at Stanford University. A graduate with distinction from the University of Bombay, he received gold medals upon graduation from the Indian Institute of Management, Ahmedabad, and the Institute of Cost and Works Accountants of India. A Chartered Accountant, he holds two masters degrees and a Ph.D. from Stanford University.

Cited by his students as a dedicated and innovative teacher, Datar received the George Leland Bach Award for Excellence in the Classroom at Carnegie Mellon University and the Distinguished Teaching Award at Stanford University.

Datar has published his research in various journals, including *The Accounting Review*, *Contemporary Accounting Research*, *Journal of Accounting, Auditing and Finance*, *Journal of Accounting and Economics*, *Journal of Accounting Research*, and *Management Science*. He has also served on the editorial board of several journals and presented his research to corporate executives and academic audiences in North America, South America, Asia, and Europe.

Datar has worked with many corporations, including AT&T, Boeing, British Columbia Telecommunications, The Cooperative Bank, Du Pont, Ford, General Motors, Hewlett-Packard, Mellon Bank, Solectron, TRW, and VISA, on field-based projects in management accounting. He is a member of the American Accounting Association and the Institute of Management Accountants.

BRIEF CONTENTS

PART ONE COST ACCOUNTING FUNDAMENTALS

- 1 The Accountant's Role in the Organization 1
- 2 An Introduction to Cost Terms and Purposes 25
- 3 Cost-Volume-Profit Relationships 59
- 4 Costing Systems and Activity-Based Costing (I): Service and Merchandising Applications 93
- 5 Costing Systems and Activity-Based Costing (II): Manufacturing Applications 131
A Walk through Dell Computer 172
Dell Computer Video Case 174

PART TWO TOOLS FOR PLANNING AND CONTROL

- 6 Master Budget and Responsibility Accounting 175
- 7 Flexible Budgets, Variances, and Management Control: I 217
- 8 Flexible Budgets, Variances, and Management Control: II 253
- 9 Income Effects of Alternative Inventory-Costing Methods 297
A Walk through Ritz-Carlton 332
Ritz-Carlton Video Case 334

PART THREE COST INFORMATION FOR DECISIONS

- 10 Determining How Costs Behave 335
- 11 Relevant Revenues, Relevant Costs, and the Decision Process 383
- 12 Pricing Decisions, Product Profitability Decisions, and Cost Management 429
A Walk through Grand Canyon Railway 468
Grand Canyon Railway Video Case 470

PART FOUR COST ALLOCATION AND REVENUES

- 13 Cost Allocation: I 471
- 14 Cost Allocation: II 509
- 15 Cost Allocation: Joint Products and Byproducts 543
- 16 Revenues, Revenue Variances, and Customer-Profitability Analysis 575
- 17 Process-Costing Systems 611
A Walk through Nally & Gibson Georgetown, Inc. 648
Nally & Gibson Georgetown, Inc. Video Case 650

PART FIVE QUALITY AND JIT

- 18 Spoilage, Reworked Units, and Scrap 651
- 19 Cost Management: Quality, Time, and the Theory of Constraints 681
- 20 Operation Costing, Just-in-Time Systems, and Backflush Costing 717
- 21 Inventory Management and Just-in-Time 747
 - A Walk through Ritz-Carlton 776
 - Ritz-Carlton Video Case 778

PART SIX CAPITAL BUDGETING

- 22 Capital Budgeting and Cost Analysis 779
- 23 Capital Budgeting: A Closer Look 821
 - A Walk through Deer Valley Resort 862
 - Deer Valley Resort Video Case 864

PART SEVEN MANAGEMENT CONTROL SYSTEMS

- 24 Measuring Input Yield, Mix, and Productivity 865
- 25 Control Systems, Transfer Pricing, and Multinational Considerations 899
- 26 Systems Choice: Performance Measurement, Compensation, and Multinational Considerations 931
 - A Walk through Dell Computer 968
 - Dell Computer Video Case 970
- Appendix A Surveys of Company Practice 971
- Appendix B Recommended Readings 975
- Appendix C Notes on Compound Interest and Interest Tables 979
- Appendix D Cost Accounting in Professional Examinations 987
- Author Index 1001
- Company Index 1002
- Subject Index 1004

CONTENTS

PREFACE



PART ONE COST ACCOUNTING FUNDAMENTALS

1

THE ACCOUNTANT'S ROLE IN THE ORGANIZATION 1

The Major Purposes of Accounting Systems	2
Management Accounting, Financial Accounting, and Cost Accounting	2
Cost Management and Accounting Systems	3
Modern Cost Accounting	3
Managers as Customers of Accounting	3
The Value Chain of Business Functions	3
Elements of Management Control	4
Planning and Control	4
Feedback: A Major Key	6
Cost-Benefit Approach	6
Organization Structure and the Management Accountant	7
Line and Staff Relationships	7
The Chief Financial Officer and the Controller	7
Scorekeeping, Attention-Directing, and Problem-Solving Functions	8
Professional Ethics	9

Ethical Guidelines 9

Typical Ethical Challenges 9

Newly Evolving Management Themes Around the Globe 12

◆ **Surveys of Company Practice: Common Ethical Dilemmas and Codes of Ethics** 13

◆ **Concepts in Action: Quality in Accounting at Motorola** 15

Problem for Self-Study 16 *Summary* 16

Terms to Learn 17 *Assignment Material* 17

2

AN INTRODUCTION TO COST TERMS AND PURPOSES 25

Costs in General	26
Cost Objects	26
Cost Accumulation and Cost Assignment	26
Direct Costs and Indirect Costs	27
Cost Tracing and Cost Allocation	27
Factors Affecting Direct/Indirect Cost Classifications	28
Cost Drivers and Cost Management	28
Cost Behavior Patterns: Variable Costs and Fixed Costs	29
Major Assumptions	30
Relevant Range	30
◆ Surveys of Company Practice: Purposes for Distinguishing Between Variable Costs and Fixed Costs	31
Relationships of Types of Costs	32
Total Costs and Unit Costs	32
Meaning of Unit Costs	32
Use Unit Costs Cautiously	33
Financial Statements and Cost Terminology	35
Service-Sector Companies	35

Merchandising- and Manufacturing-Sector Companies	36
Merchandising-Sector Example	36
Manufacturing-Sector Example	38
Manufacturing Costs	40
Three-Part and Two-Part Cost Classifications	40
◆ Concepts in Action: Harley-Davidson Eliminates the Direct Manufacturing Labor Cost Category	41
Prime Costs and Conversion Costs	41
Benefits of Defining Accounting Terms	42
The Many Meanings of Product Costs	43
Classifications of Costs	43
<i>Problem for Self-Study</i>	44
<i>Summary</i>	46
<i>Terms to Learn</i>	47
<i>Assignment Material</i>	47

3

COST-VOLUME-PROFIT RELATIONSHIPS 59

Revenue Drivers and Cost Drivers: The General Case and a Special Case	60
Terminology and Abbreviations	61
CVP Assumptions	61
The Breakeven Point	62
Equation Method	62
Contribution Margin Method	62
Graph Method	63
Target Operating Income	64
The PV Graph	65
Sensitivity Analysis and Uncertainty	65
Cost Planning and CVP	66
Alternative Fixed-Cost/Variable-Cost Structures	66
◆ Concepts in Action: How a Jobs-Bank Agreement Increased GM's Breakeven Point	68
Effect of Time Horizon	68
Effects of Revenue Mix on Income	69
Role of Income Taxes	70
Nonprofit Institutions and CVP	71
Contribution Margin and Gross Margin	71
Merchandising Sector	72
Manufacturing Sector	72
<i>Problem for Self-Study</i>	73
<i>Summary</i>	74
Appendix: Decision Models and Uncertainty	75
Coping with Uncertainty	75
<i>Terms to Learn</i>	79
<i>Assignment Material</i>	79

4

COSTING SYSTEMS AND ACTIVITY-BASED COSTING (I): SERVICE AND MERCHANDISING APPLICATIONS 93

Building Block Concept of Costing Systems	94
Job-Costing and Process-Costing Systems	95
Job Costing in Service Organizations Using Actual Costing	96
Job Costing of an Audit Engagement	96
General Approach to Job Costing	96
Source Documents	97
Normal Costing	98
Time Period Used to Compute Indirect-Cost Rates	100
Extended Normal Costing	101
Broad Averaging via Peanut-Butter Costing Approaches	102
Undercosting and Overcosting	102
Product-Cost Cross-Subsidization	103
Refining a Costing System	103
Cost Refinement in the Service Sector	105
Refinement via Increased Direct-Cost Tracing	105
Refinement via Increased Number of Indirect-Cost Pools and Cost Drivers	106
Activity-Based Costing in Merchandising	107
◆ Concepts in Action: Banks End the "Free Lunch" for Many Services	109
◆ Surveys of Company Practice: Growing Interest in Activity-Based Costing	112
<i>Problem for Self-Study</i>	113
<i>Summary</i>	114
<i>Appendix: Computation of Direct Labor Cost Rates</i>	115
<i>Terms to Learn</i>	116
<i>Assignment Material</i>	117

5

COSTING SYSTEMS AND ACTIVITY-BASED COSTING (II): MANUFACTURING APPLICATIONS 131

Job Costing in Manufacturing	132
Source Documents	134
◆ Surveys of Company Practice: Cost-Allocation Bases Used for Manufacturing Overhead	135
An Illustration of a Job-Costing System in Manufacturing	135
General Ledger and Subsidiary Ledgers	135
Explanations of Transactions	137

Budgeted Indirect Costs and End-of-Period Adjustments	140
Adjusted Allocation Rate Approach	141
Proration Approach	142
Choice among Approaches	143
Activity-Based Costing in Manufacturing	144
Previous Costing System	144
Cost Refinement with Activity-Based Costing	146
Insights Available with ABC	148
Activity-Based Costing and End-of-Period Adjustments	149
◆ Concepts in Action: How Clark-Hurth Implemented Activity-Based Costing	149
Cost Hierarchies	150
Manufacturing Cost Hierarchy	150
Unit Cost Computation	152
Traditional versus ABC Approach to Designing a Costing System	152
<i>Problem for Self-Study</i>	153
<i>Summary</i>	155
<i>Terms to Learn</i>	156
<i>Assignment Material</i>	156
A Walk through Dell Computer	172
Dell Computer Video Case	174



PART TWO TOOLS FOR PLANNING AND CONTROL

6 MASTER BUDGET AND RESPONSIBILITY ACCOUNTING 175

Major Features of Budgets	176
Definition and Role of Budgets	176
Advantages of Budgets	177
Strategy and Plans	177
A Framework for Judging Performance	177
Coordination and Communication	178
Management Support and Administration	178
Types of Budgets	179
Time Coverage	179
Terminology	179
An Illustration of a Master Budget	179
Basic Data and Requirements	181

Steps in Preparing an Operating Budget	182
Computer-Based Financial Planning Models	187
◆ Surveys of Company Practice: Budget Practices Around the Globe	188
Kaizen Budgeting	189
Kaizen at Citizen Watch	189
Activity-Based Budgeting	189
Budgeting and Responsibility Accounting	191
Organizational Structure and Responsibility	191
Feedback and Fixing Blame	192
Responsibility and Controllability	192
Definition of Controllability	192
Emphasis on Information and Behavior	192
◆ Concepts in Action: The Budget Games that People Play	193
Human Aspects of Budgeting	194
Budgeting: A Discipline in Transition	194
<i>Problem for Self-Study</i>	195
<i>Summary</i>	195
Appendix: The Cash Budget	196
Preparation of Budgets	197
<i>Terms to Learn</i>	200
<i>Assignment Material</i>	200

7

FLEXIBLE BUDGETS, VARIANCES, AND MANAGEMENT CONTROL: I 217

Static Budgets and Flexible Budgets	218
Static-Budget Variances	219
Steps in Developing a Flexible Budget	220
Flexible-Budget Variances and Sales-Volume Variances	221
Flexible-Budget Variances	222
Sales-Volume Variances	223
Price Variances and Efficiency Variances for Inputs	223
Obtaining Budgeted Input Prices and Input Quantities	224
◆ Surveys of Company Practice: The Widespread Use of Standard Costs	225
An Illustration of Price and Efficiency Variances for Inputs	225
Price Variances	226
Efficiency Variances	227
Presentation of Price and Efficiency Variances for Inputs	228
Overview of Variance Analysis	228
Performance Measurement Using Variances	228
Effectiveness and Efficiency	228
Continuous Improvement	229
◆ Concepts in Action: Total Costs of Materials Ownership at Parker-Hannifin	231

Value-Chain Explanations of Variances	232
When to Investigate Variances	232
Financial and Nonfinancial Performance Measures	232
◆ Surveys of Company Practice: The Decision to Investigate Variances	233
Impact of Inventories	233
An Illustration of Journal Entries Using Standard Costs	234
Control Feature of Standard Costs	234
End-of-Period Adjustments	235
Benchmarking and Variance Analysis	235
<i>Problem for Self-Study</i>	237
<i>Summary</i>	238
<i>Terms to Learn</i>	239
<i>Assignment Material</i>	239

8

FLEXIBLE BUDGETS, VARIANCES, AND MANAGEMENT CONTROL: II 253

Planning of Variable- and Fixed-Overhead Costs	254
Planning Variable-Overhead Costs	254
Planning Fixed-Overhead Costs	254
◆ Surveys of Company Practice: Manufacturing Overhead Allocation Bases and Rates in the Electronics Industry	255
Webb Company Data	256
Developing Budgeted Variable-Overhead Rates	256
Variable-Overhead Cost Variances	256
Static-Budget and Flexible-Budget Analyses	257
Variable-Overhead Efficiency Variance	258
Variable-Overhead Spending Variance	259
Developing Budgeted Fixed-Overhead Rates	260
Fixed-Overhead Cost Variances	261
Production-Volume Variance	262
Interpreting the Production-Volume Variance	263
Integrated Analysis of Overhead Cost Variances	263
Overhead Cost Variances in Nonmanufacturing Settings	264
◆ Concepts in Action: Baxter Corporation Reduces Emphasis on Individual Variances as Independent Performance Measures	265
Different Purposes of Manufacturing Overhead Cost Analysis	265
Variable Manufacturing Overhead Costs	266
Fixed Manufacturing Overhead Costs	267

Journal Entries for Overhead Costs and Variances	267
Recording Overhead Costs	267
Overhead Variances and End-of-Period Adjustments	268
Financial and Nonfinancial Performance Measures	268
Actual, Normal, Extended-Normal, and Standard Costing	* 269
<i>Problem for Self-Study</i>	270
<i>Summary</i>	272
Appendix A: Proration of Manufacturing Variances Using Standard Costs	273
Proration of Direct Manufacturing Labor and Manufacturing Overhead Variances	274
Proration of Direct Materials Variances	276
Alternative Views on Proration	278
Appendix B: Engineered, Discretionary, and Infrastructure Costs	278
Relationships between Inputs and Outputs	279
Work Measurement and Engineered Costs	280
Negotiated Static Budgets and Discretionary Costs	280
Variance Analysis for Engineered and Discretionary Overhead Costs	281
<i>Terms to Learn</i>	283
<i>Assignment Material</i>	283

9

INCOME EFFECTS OF ALTERNATIVE INVENTORY-COSTING METHODS 297

◆ PART ONE: INVENTORY-COSTING METHODS	298
Variable Costing and Absorption Costing	298
Comparison of Standard Variable Costing and Standard Absorption Costing	301
Comparative Income Statements	302
Explaining Differences in Operating Income	304
Effect of Sales and Production on Operating Income	305
Breakeven Points in Variable and Absorption Costing	306
Throughput Costing	308
Capsule Comparison of Inventory-Costing Methods	308
Performance Measures and Absorption Costing	310
Undesirable Buildups of Inventories	310
◆ Concepts in Action: Nothing Beats a Great Deduction: The IRS and Packaging Design Costs	311
Proposals for Revising Performance Evaluation	311

◆ Surveys of Company Practice: Company Usage of Variable Costing	312
◆ PART TWO: DENOMINATOR-LEVEL CONCEPTS AND ABSORPTION COSTING	313
Alternative Denominator-Level Concepts	313
Theoretical Capacity and Practical Capacity	313
Normal Utilization and Master-Budget Utilization	314
Effect on Financial Statements	314
<i>Problem for Self-Study</i>	316
<i>Summary</i>	317
<i>Terms to Learn</i>	318
<i>Assignment Material</i>	318
A Walk through Ritz-Carlton	332
Ritz-Carlton Video Case	334



PART THREE COST INFORMATION FOR DECISIONS

10

DETERMINING HOW COSTS BEHAVE 335

General Issues in Estimating Cost Functions	336
Basic Assumptions and Examples of Cost Functions	336
Basic Terms	338
The Cause-and-Effect Criterion in Choosing Cost Drivers	339
◆ Surveys of Company Practice: International Comparison of Cost Classification by Companies	339
Cost Estimation Approaches	340
Industrial-Engineering Method	340
Conference Method	341
Account Analysis Method	341
Quantitative Analyses of Cost Relationships	342
Steps in Estimating a Cost Function	342
High-Low Method	344
Regression Analysis Method	345
Evaluating and Choosing Cost Drivers	347
Nonlinearity and Cost Functions	348
◆ Concepts in Action: Activity-Based Costing and Cost Estimation	349

Learning Curves and Nonlinear Cost Functions	351
Cumulative Average-Time Learning Model	351
Incremental Unit-Time Learning Model	351
Setting Prices, Budgets, and Standards	354
Data Collection and Adjustment Issues	354
<i>Problem for Self-Study</i>	356
<i>Summary</i>	357
Appendix: Regression Analysis	358
Estimating the Regression Line	358
Goodness of Fit	359
Significance of Independent Variables	360
Specification Analysis of Estimation Assumptions	361
Using Regression Output to Choose Among Cost Functions	363
Multiple Regression and Cost Hierarchies	363
Multicollinearity	366
<i>Terms to Learn</i>	366
<i>Assignment Material</i>	367

11

RELEVANT REVENUES, RELEVANT COSTS, AND THE DECISION PROCESS 383

Information and the Decision Process	384
Predictions and Models	384
Models and Feedback	384
The Meaning of Relevance	385
Relevant Costs and Relevant Revenues	385
Qualitative Factors Can Be Relevant	386
An Illustration of Relevance: Choosing Output Levels	387
One-Time-Only Special Orders	387
How Unit Costs Can Mislead	389
Pitfalls in Relevant-Cost Analysis	389
Confusing Terminology	389
Outsourcing and Make-Versus-Buy Decisions	390
Outsourcing and Idle Facilities	390
Opportunity Costs, Outsourcing, and Capacity Constraints	392
◆ Concepts in Action: Chevron and British Petroleum—Rivals in the Oil Patch but Partners in Outsourcing Distribution	393
Carrying Costs of Inventory	395
Product-Mix Decisions Under Capacity Constraints	396
◆ Concepts in Action: Contracting and Opportunity Costs	397
Customer Profitability, Activity-Based Costing, and Relevant Costs	398

Relevant-Cost Analysis of Dropping a Customer 398
 Relevant-Cost Analysis of Adding a Customer 400

Irrelevance of Past Costs and Equipment-Replacement Decisions 400

Decisions and Performance Evaluation 402
Problem for Self-Study 404 *Summary* 405

Appendix: Linear Programming 406

Steps in Solving an LP Problem 406

Sensitivity Analysis 409

Terms to Learn 410 *Assignment Material* 410

12

PRICING DECISIONS, PRODUCT PROFITABILITY DECISIONS, AND COST MANAGEMENT 429

Major Influences on Pricing 430

Product-Cost Categories and Time Horizon 431

Costing and Pricing for the Short Run 431

A One-Time-Only Special Order 431

Costing and Pricing for the Long Run 433

Calculating Product Costs 433

Alternative Long-Run Pricing Approaches 435

Target Costing for Target Pricing 436

Implementing Target Pricing and Target Costing 436

Cost Incurrence and Locked-in Costs 438

Achieving the Target Cost per Unit for Provalue 439

◆ **Concepts in Action: Target Costing at CFM International, Toyota, and Nissan** 441

Cost-Plus Pricing 442

Cost-Plus Target Rate of Return on Investment 442

Alternative Cost-Plus Methods 443

Cost-Plus Pricing and Target Pricing 444

◆ **Surveys of Company Practice: Differences in Pricing Practices and Cost Management Methods in Various Countries** 445

Considerations Other Than Costs in Pricing Decisions 445

Life-Cycle Product Budgeting and Costing 446

Life-Cycle Budgeting and Pricing Decisions 447

Developing Life-Cycle Reports 448

Effects of Antitrust Laws on Pricing 449

Problem for Self-Study 451 *Summary* 451

Terms to Learn 453 *Assignment Material* 453

A Walk through Grand Canyon Railway 468

Grand Canyon Railway Video Case 470

PART FOUR COST ALLOCATION AND REVENUES



13

COST ALLOCATION: I 471

The Terminology of Cost Allocation 472

Purposes of Cost Allocation 472

◆ **Surveys of Company Practice: Why Allocate Corporate and Other Support Costs to Divisions and Departments?** 474

Criteria for Guiding Cost-Allocation Decisions 474

The Role of Dominant Criteria 474

The Cost-Benefit Consideration 476

◆ **Concepts in Action: How a Quart of Distilled Water Cost Cindy Chase \$17** 476

Cost Allocation and Costing Systems 477

Indirect Cost Pools and Cost Allocation 478

Choices Related to Indirect Costs 478

Homogeneity of Cost Pools 479

Recognizing More Cost Pools 480

Allowability of Costs in Cost Pools 480

Allocating Costs from One Department to Another 480

Single-Rate and Dual-Rate Methods 480

Budgeted versus Actual Rates 482

Budgeted versus Actual Usage Allocation Bases 482

Allocating Costs of Support Departments 483

Operating Departments and Support Departments 483

Support Department Cost-Allocation Methods 484

Direct Allocation Method 484

Step-Down Allocation Method 484

Reciprocal Allocation Method 486

Overview of Methods 489

Allocating Common Costs 489

◆ **Surveys of Company Practice: Allocation of Support Department Costs** 490

Stand-Alone Cost-Allocation Method 490

Incremental Cost-Allocation Method 490

Problem for Self-Study 491 *Summary* 492

Terms to Learn 494 *Assignment Material* 494

14

COST ALLOCATION: II 509

- Cost Tracing and Cost Allocation 510
- Choosing Indirect-Cost Pools and Determining Cost Rates 511
 - Plantwide Rates versus Department Rates 512
- Changes in Cost Allocation Bases 513
 - Consequences of an Inappropriate Allocation Base 514
 - Cost Drivers and Allocation Bases 515
 - ◆ **Surveys of Company Practice: Is the Product-Costing System Broken?** 516
- Contract Cost Justification and Reimbursement 516
 - Contracting with the U.S. Government 517
 - CASB Standards and Interpretations 517
 - Fairness of Pricing 517
- Cost Allocations and Used/Unused Capacity Distinctions 518
 - Capacity's Effect on Indirect-Cost Rates 518
 - Unused Capacity Costs and the Downward Demand Spiral 519
- Challenges in Measuring Capacity 520
- Cost Assignment and Cost Hierarchies 521
 - Organization-Structure Cost Hierarchy 521
 - ◆ **Concepts in Action: Cost Hierarchies Down on the Farm** 522
 - Brand Cost Hierarchy 522
 - Problem for Self-Study 523
 - Summary 525 Terms to Learn 526
 - Assignment Material 526

15

COST ALLOCATION: JOINT PRODUCTS AND BYPRODUCTS 543

- Meaning of Terms 544
- Why Allocate Joint Costs? 545
- Approaches to Allocating Joint Costs 546
 - Sales Value at Splitoff Method 547
 - Physical Measure Method 548
 - Estimated Net Realizable Value Method 550
 - Constant Gross-Margin Percentage NRV Method 551
 - ◆ **Concepts in Action: Chicken Processing: Costing on the Disassembly Line** 553
 - Comparison of Methods 553
- No Allocation of Joint Costs 554
 - ◆ **Surveys of Company Practice: Joint-Cost-Allocation Methods Used by U.K. Companies** 555
- Irrelevance of Joint Costs for Decision Making 555

Sell or Process Further 555

Accounting for Byproducts 557

Alternative Approach 559

Problem for Self-Study 560 Summary 562

Terms to Learn 562 Assignment Material 562

16

REVENUES, REVENUE VARIANCES, AND CUSTOMER-PROFITABILITY ANALYSIS 575

- ◆ **PART ONE: REVENUE ANALYSIS** 576
- Revenue Tracing 576
 - Revenue Tracing and Sales Returns 576
 - Broad Averaging via Peanut-Butter Revenue Adjustments 577
- Revenue Allocation 578
 - Stand-Alone Revenue-Allocation Methods 579
 - Incremental Revenue-Allocation Method 580
- ◆ **PART TWO: REVENUE AND SALES VARIANCES** 581
- Variance Analysis for Multiple Products 581
 - Static-Budget Variance 582
 - Flexible-Budget and Sales-Volume Variances 582
 - Sales-Quantity Variance 583
 - Sales-Mix Variance 583
 - Market-Size and Market-Share Variances 584
- Variance Analysis for Multiple Countries 587
- ◆ **PART THREE: CUSTOMER PROFITABILITY ANALYSIS** 590
- Customer Revenues 590
- Customer Costs 591
 - Allocate All Costs to Individual Customers 591
- Customer-Profitability Profiles 593
- ◆ **Surveys of Company Practice: Customer-Profitability Analysis Attracts Increasing Attention** 594
- Customer-Cost Hierarchy 595
- ◆ **Concepts in Action: Hewlett-Packard Adopts Customer-Profitability Analysis** 597
 - Problem for Self-Study 597 Summary 599
 - Terms to Learn 600 Assignment Material 600

17

PROCESS-COSTING SYSTEMS 611

- Illustrating Process Costing 612
- ◆ **Surveys of Company Practice: Process Costing in Different Industries** 613
- Case 1: Process Costing with No Beginning or Ending Work-in-Process Inventory 613

Case 2: Process Costing with No Beginning but an Ending Work-in-Process Inventory	614
Physical Units and Equivalent Units (Steps 1 and 2)	615
Calculation of Product Costs (Steps 3 and 4)	616
Journal Entries	618
Case 3: Process Costing with Both Beginning and Ending Work-in-Process Inventory	619
Weighted-Average Method	620
First-In, First-Out Method	624
Comparison of Weighted-Average and FIFO Methods	623
Standard Costs and Process Costing	625
Computations Under Standard Costing	626
Accounting for Variances	626
Transferred-in Costs in Process Costing	630
Transferred-in Costs and the Weighted-Average Method	630
Transferred-in Costs and the FIFO Method	632
Common Mistakes with Transferred-in Costs	634
◆ Concepts in Action: Process Costing in the Ceramics Industry	635
<i>Problem for Self-Study</i>	636
<i>Summary</i>	636
<i>Terms to Learn</i>	637
<i>Assignment Material</i>	637
A Walk through Nally & Gibson Georgetown, Inc.	648
Nally & Gibson Georgetown, Inc. Video Case	650

Computing Spoiled Units	655
Follow the Four-Step Approach	655
Weighted-Average Method and Spoilage	656
FIFO Method and Spoilage	658
Journal Entries	658
Standard Costs and Spoilage	658
Assumptions for Allocating Normal Spoilage	660
Spoilage, Rework, and Scrap in Job-Costing Systems	660
Job Costing and Spoilage	662
Reworked Units	663
Accounting for Scrap	663
◆ Surveys of Company Practice: Rejection in the Electronics Industry	664
Recognizing Scrap at the Time of Sale of Scrap	665
◆ Concepts in Action: Managing Waste and Environmental Costs at the DuPont Corporation	666
Recognizing Scrap at the Time of Production of Scrap	666
<i>Problem for Self-Study</i>	667
<i>Summary</i>	668
Appendix: Inspection and Spoilage at Intermediate Stages of Completion in Process Costing	668
<i>Terms to Learn</i>	670
<i>Assignment Material</i>	670



PART FIVE QUALITY AND JIT

18

SPOILAGE, REWORKED UNITS, AND SCRAP 651

Management Effort and Control	652
Spoilage in General	652
Normal Spoilage	653
Abnormal Spoilage	653
Process Costing and Spoilage	653
Count All Spoilage	653

19

COST MANAGEMENT: QUALITY, TIME, AND THE THEORY OF CONSTRAINTS 681

Quality as a Competitive Weapon	682
Two Aspects of Quality	683
Costs of Quality	683
Methods Used to Identify Quality Problems	686
Control Charts	686
Pareto Diagrams	687
Cause-and-Effect Diagrams	687
Relevant Costs and Benefits of Quality Improvement	688
◆ Concepts in Action: Crysel Wins Premio Nacional de Calidad—Mexico's Premier Quality Award	690
Quality and Customer-Satisfaction Measures	691
Financial Measures of Customer Satisfaction	691
Nonfinancial Measures of Customer Satisfaction	692
Quality and Internal Performance Measures	692

Evaluating Quality Performance	692
Advantages of the Costs of Quality (COQ) Measures	692
Advantages of Nonfinancial Measures of Quality	693
Time as a Competitive Weapon	693
Operational Measures of Time	693
Customer-Response Time	693
Effects of Uncertainty and Bottlenecks on Delays	694
On-Time Performance	696
Costs of Time	696
Relevant Revenues and Relevant Costs	696
Theory of Constraints and Throughput Contribution Analysis	698
◆ Concepts in Action: Throughput Accounting at Allied-Signal Skelmersdale, United Kingdom	700
<i>Problem for Self-Study</i>	701
<i>Summary</i>	702
<i>Terms to Learn</i>	703
<i>Assignment Material</i>	703

20

OPERATION COSTING, JUST-IN-TIME SYSTEMS, AND BACKFLUSH COSTING 717

Hybrid and Simplified Job-Costing Systems	718
Operation Costing	718
Overview of Operation Costing	718
An Illustration of Operation Costing	719
Journal Entries	720
Relation of Operation Costing to Other Costing Systems	721
Just-in-Time Systems	722
Major Features of JIT Production Systems	722
Organizing Manufacturing Cells	723
Multiskilled Workers	723
Total Quality Management	724
Reducing Manufacturing Lead Time and Setup Time	724
Strong Supplier Relationships	724
Financial Benefits of JIT	725
Product-Costing Benefits of JIT	725
Backflush Costing	726
Simplified Budgeted or Standard Job Costing	726
◆ Concepts in Action: Implementing JIT Production and Backflushing at the Eaton Corporation	727

Example 1: Trigger Points Are Materials Purchases and Finished Goods Completion	727
Accounting for Variances	729
Example 2: Trigger Points Are Materials Purchases and Finished Goods Sales	731
Example 3: Trigger Point Is Finished Goods Completion	732
◆ Surveys of Company Practice: Adopt JIT and Simplify Your Life as a Management Accountant	733
Special Considerations in Backflush Costing	734
<i>Problem for Self-Study</i>	735
<i>Summary</i>	737
<i>Terms to Learn</i>	737
<i>Assignment Material</i>	737

21

INVENTORY MANAGEMENT AND JUST-IN-TIME 747

Managing Goods for Sale in Retail Organizations	748
Costs Associated with Goods for Sale	748
Economic-Order-Quantity Decision Model	749
When to Order, Assuming Certainty	751
Safety Stock	752
Challenges in Estimating Inventory-Related Costs and Their Effects	753
Considerations in Obtaining Estimates of Relevant Costs	753
Cost of a Prediction Error	755
Goal-Congruence Issues	756
Just-in-Time Purchasing	756
EOQ Implications of JIT Purchasing	756
Relevant Benefits and Relevant Costs of JIT Purchasing	756
◆ Concepts in Action: Porsche's Just-in-Time Revival	757
Supplier Evaluation and Relevant Costs of Quality and Timely Deliveries	758
Inventory Costs and Its Management in Manufacturing Organizations	759
JIT Production, Quality, and Relevant Costs	761
◆ Surveys of Company Practice: JIT Performance Measures Around the Globe	761
Performance Measures and Control in JIT Production	762
<i>Problems for Self-Study</i>	762
<i>Summary</i>	764
<i>Terms to Learn</i>	765
<i>Assignment Material</i>	765
A Walk through Ritz-Carlton	776
Ritz-Carlton Video Case	778

PART SIX CAPITAL BUDGETING

22

CAPITAL BUDGETING AND COST ANALYSIS 779

- Two Focuses of Cost Analysis 780
- Stages of Capital Budgeting 781
- Discounted Cash-Flow Methods 783
 - Net Present-Value Method 783
 - Internal Rate-of-Return Method 785
 - Comparison of Net Present-Value and Internal Rate-of-Return Methods 787
- Sensitivity Analysis 788
- Relevant Cash Flows in Discounted Cash-Flow Analysis 789
- Payback Method 791
 - Uniform Cash Flows 791
 - Nonuniform Cash Flows 792
- Accrual Accounting Rate-of-Return Method 793
 - ◆ **Surveys of Company Practice: International Comparison of Capital-Budgeting Methods 794**
- Breakeven Time and Capital Budgeting for New Products 795
 - An Example of BET Computations 795
 - Uses and Limitations of BET 797
- Complexities in Capital-Budgeting Applications 797
 - Predicting the Full Set of Benefits and Costs 797
 - Recognizing the Full Time Horizon of the Project 798
 - Performance Evaluation and the Selection of Projects 798
 - ◆ **Concepts in Action: Integrating Environmental Costs and Capital Budgeting at Niagara Mohawk and Ontario Hydro 799**
- Managing the Project 800
 - Management Control of the Investment Activity 800

- Management Control of the Project—
 - Postinvestment Audit 800
 - Problem for Self-Study 800 Summary 802*
- Appendix: Control of Job Projects 803
 - Project Variances 803
 - Focus on the Future 805
 - Terms to Learn 806 Assignment Material 806*

23

CAPITAL BUDGETING: A CLOSER LOOK 821

- Income Tax Factors 822
 - The Importance of Income Taxes 822
 - Treatment of Depreciation for Tax Purposes 822
- Income Tax Considerations in Capital Budgeting 825
 - Total Project Approach 826
 - Differential Approach 831
 - U.S. Income Tax Laws 833
- Capital Budgeting and Inflation 833
 - Real and Nominal Rates of Return 834
 - Net Present-Value Method and Inflation 834
 - Inflation and Other Capital-Budgeting Methods 838
- Project Risk and Required Rate of Return 838
 - ◆ **Concepts in Action: Risk Analysis in Capital Budgeting Decisions at Consumers Power 839**
- Applicability to Nonprofit Organizations 840
- Implementing the Net Present-Value Decision Rule 840
 - ◆ **Surveys of Company Practice: Risk Adjustment Methods in Capital Budgeting 841**
- Implementing the Internal Rate-of-Return Decision Rule 843
 - Problem for Self-Study 843 Summary 845*
- Appendix: Modified Accelerated Cost Recovery System 846
 - Amount Allowable for Depreciation 846
 - Time Period over Which the Asset Is To Be Depreciated 846
 - Pattern of Allowable Depreciation (for a Given Time Period) 847
 - Terms to Learn 848 Assignment Material 848*
- A Walk through Deer Valley Resort 862**
- Deer Valley Resort Video Case 864**



PART SEVEN MANAGEMENT CONTROL SYSTEMS

24

MEASURING INPUT YIELD, MIX, AND PRODUCTIVITY 865

- ◆ PART ONE: INPUT VARIANCES 866
 - Direct Materials Yield and Mix Variances 866
 - Direct Materials Efficiency and Price Variances 867
 - The Role of Direct Materials Yield and Direct Materials Mix Variances 868
 - Direct Manufacturing Labor Yield and Mix Variances 871
- ◆ PART TWO: PRODUCTIVITY MEASUREMENT 873
 - ◆ **Surveys of Company Practice: International Manufacturing Productivity Growth** 874
 - Partial Productivity Measures 875
 - Evaluating Changes in Partial Productivities and Their Relation to Efficiency Variances 876
 - Total Factor Productivity 878
 - Calculating Total Factor Productivity and Change in Total Factor Productivity 878
 - Using Partial and Total Factor Productivity Measures 879
 - ◆ **Concepts in Action: Productivity Improvement and Gain Sharing as Keys to Competitiveness at Whirlpool** 880
 - Analysis of Annual Cost Changes 881
 - Service-Sector Productivity 883
 - Problem for Self-Study* 884 *Summary* 886
 - Terms to Learn* 888 *Assignment Material* 888

25

CONTROL SYSTEMS, TRANSFER PRICING, AND MULTINATIONAL CONSIDERATIONS 899

- Management Control Systems 900
- Evaluating Management Control Systems 901
- Organizational Structure and Decentralization 901

- Benefits of Decentralization 902
- Costs of Decentralization 903
- Comparison of Benefits and Costs 903
- Decentralization in Multinational Companies 904
- Choices About Responsibility Centers 904
- Transfer Pricing 904
 - Alternative Transfer-Pricing Methods 905
- An Illustration of Transfer Pricing 905
- Market-Based Transfer Prices 908
 - Perfectly Competitive Market Case 908
 - Distress Prices 908
- Cost-Based Transfer Prices 909
 - Full-Cost Bases 909
 - Prorating the Difference between Minimum and Maximum Transfer Prices 910
 - Dual Pricing 911
- Negotiated Transfer Prices 911
- ◆ **Surveys of Company Practice: Domestic and Multinational Transfer-Pricing Practices** 912
- A General Guideline for Transfer-Pricing Situations 913
- Multinational Transfer Pricing and Tax Considerations 914
 - ◆ **Concepts in Action: U.S. Internal Revenue Service, Japanese National Tax Agency, and Transfer Pricing Games** 916
 - Problem for Self-Study* 916 *Summary* 918
 - Terms to Learn* 919 *Assignment Material* 919

26

SYSTEMS CHOICE: PERFORMANCE MEASUREMENT, COMPENSATION, AND MULTINATIONAL CONSIDERATIONS 931

- Financial and Nonfinancial Performance Measures 932
 - ◆ **Surveys of Company Practice: Nonfinancial Measures of Performance** 933
- Designing an Accounting-Based Performance Measure 933
- Different Performance Measures 934
 - Return on Investment 935
 - Residual Income 936
 - Economic Value Added (EVA®) 937
 - Return on Sales 938
- Alternative Definitions of Investment 939
- Measurement Alternatives for Assets 940
 - Present Value 940

- Current Cost 941
- Long-Term Assets: Gross or Net Book Value? 943
- Choosing Targeted Levels of Performance and Timing of Feedback 944
 - Choosing Targets to Compare Performance 944
 - Timing of Feedback 944
- Performance Measurement in Multinational Companies 944
 - Calculating the Foreign Division's ROI in the Foreign Currency 945
 - Calculating the Foreign Division's ROI in U.S. Dollars 945
- Distinction Between Managers and Organizational Units 946
 - The Basic Trade-off: Creating Incentives versus Imposing Risk 947
 - Intensity of Incentives and Financial and Nonfinancial Measurements 948
 - Benchmarks and Relative Performance Evaluation 948
 - ◆ **Concepts in Action: Kidder Peabody's Paper Profits and High Compensations** 949
- Performance Measures at the Individual Activity Level 949
 - Performing Multiple Tasks 949
 - Team-Based Compensation Arrangements 950

- Executive Performance Measures and Compensation 950
- Environmental and Ethical Responsibilities 951
 - Problem for Self-Study* 952 *Summary* 953
 - Terms to Learn* 954 *Assignment Material* 954

A Walk through Dell Computer 968

Dell Computer Video Case 970

APPENDIX A SURVEYS OF COMPANY PRACTICE 971

APPENDIX B RECOMMENDED READINGS 975

APPENDIX C NOTES ON COMPOUND INTEREST AND INTEREST TABLES 979

APPENDIX D COST ACCOUNTING IN PROFESSIONAL EXAMINATIONS 987

GLOSSARY 991

AUTHOR INDEX 1001

COMPANY INDEX 1002

SUBJECT INDEX 1004

PREFACE

Studying cost accounting is one of the best business decisions a student can make. Why? Because success in any business—from the smallest corner store to the largest multinational corporation—requires the use of cost accounting principles and practices. Cost accounting provides key data to managers for planning and controlling, as well as for costing products, services, and customers. Today especially, as more and more cost accountants are being called on to become decision makers instead of data providers, our theme of “different costs for different purposes,” which we stress throughout the book, is essential for a thorough and useful accounting education. By focusing on basic concepts, analyses, uses, and procedures instead of procedures alone, we recognize cost accounting as a managerial tool for business strategy and implementation, and we also prepare students for the rewards and challenges facing them in the world of professional cost accounting both today and tomorrow.

STRENGTHS OF THE EIGHTH EDITION RETAINED AND ENHANCED

Reviewers of the eighth edition praised the following features, which have been retained and strengthened in the ninth edition:

- ◆ Clarity and understandability of the text
- ◆ Coverage of important topics, including current developments in actual practice
- ◆ Extensive use of real-world examples
- ◆ Excellent quantity, quality, and range of assignment material
- ◆ Helpful Problems for Self-Study for each chapter
- ◆ Flexible organization through a modular approach

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

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

As an example of the book's flexibility, consider our treatment of process costing. Process costing is described in Chapters 17 and 18. Instructors interested in filling out a student's perspective of costing systems can move directly from job-order costing described in Chapters 4 and 5 to Chapter 17 without interruption in the flow of material. Other instructors may want their students to delve into budgeting and more decision-oriented topics early in the course. These instructors may prefer to postpone discussion of process costing.

CHANGES IN CONTENT AND PEDAGOGY OF THE NINTH EDITION

The pace of change in organizations continues to be rapid. The ninth edition of *Cost Accounting* reflects changes occurring in the role of cost accounting in organizations and in research on cost accounting. We have shortened and streamlined individual chapters, focused on the major issues facing the management accountant, and achieved greater integration across chapters. Each chapter was scrutinized by knowledgeable critics before a final draft was reached.

1. *Newly evolving management themes.* These themes guided us in choosing the topics to be given increased emphasis.

- ◆ *Focus on customers.* Chapter 1 takes a customer-driven perspective on changes in cost accounting. The customer focus is emphasized in many other chapters. For example, Chapters 11 and 16 include sections on customer costing and profitability analysis.
- ◆ *Key success factors,* such as cost, quality, and time. Chapters 8 and 12 include discussion on cost planning and cost management. Chapter 19 discusses cost management aspects of quality and time. Chapter 21 describes cost management issues in just-in-time environments.
- ◆ *Total value-chain analysis.* The value chain is systematically emphasized throughout the book. Chapter 1 introduces the value chain. The text in many areas (such as Chapter 2 on cost drivers, Chapter 6 on budgeting, Chapter 7 on explanations for variances, and Chapter 12 on pricing decisions) emphasizes the importance of considering all areas of the value chain. We have also integrated value-chain analysis in our discussion of quality in Chapter 19 and just-in-time in Chapter 21.
- ◆ *Dual internal/external focus.* Topics such as benchmarking (Chapter 7) and customer satisfaction (Chapter 19) highlight the increased attention given to external factors in management accounting. Greater recognition is given to how cost accounting is expanding its horizons to incorporate environment-related considerations, for example in capital budgeting (Chapter 22) and performance evaluation (Chapter 26).
- ◆ *Continuous improvement.* Topics such as kaizen budgeting (Chapter 6) and productivity (Chapter 24) focus on the heightened emphasis companies now give to continuous improvement.

2. *Broad coverage of the service sector.* The service sector is now the single largest sector in the economy, and it is sometimes easier to use in teaching because there is no work in process to consider. Chapter 2 discusses cost concepts in the service sector as well as in the merchandising and manufacturing sectors. Chapter 4 illustrates job costing in the service sector. Chapter 16 on revenue analysis, Chapter 22 on capital budgeting, Chapter 25 on transfer pricing, and Chapter 26 on performance evaluation are discussed using service-sector illustrations.

3. *Expanded global content of the text.* Our coverage of international business is highly visible in our continued use of boxed features: Surveys of Company Practice and Concepts in Action. Both types of boxes, described in more detail later, draw on businesses from around the globe. In addition, company examples from many different countries are cited throughout the chapter material. Chapter 16 on revenue analysis, Chapter 25 on transfer pricing, and Chapter 26 on performance evaluation have expanded discussions within multinational contexts.

4. *Professional ethics.* The ninth edition continues our emphasis on ethics. The second-to-last problem in every chapter of the book has a component on ethics. This feature gives the instructor the flexibility to reinforce the importance of ethics in as many areas as is deemed appropriate.

5. *Cost management.* The eighth edition expanded its coverage of cost management. The ninth edition continues this expansion. Each chapter has an explicit discussion

of how the ideas described in it help the management accountant to plan, manage, and control costs.

Activity-based management is integrated into many chapters of the ninth edition. Chapter 2 discusses cost drivers and value-added costs. Chapters 4 and 5 illustrate how an activity-based costing approach can be used to refine job-costing systems. Chapter 6 illustrates activity-based budgeting. Chapter 11 applies activity-based costing to decisions regarding adding or dropping customers. Chapter 12 discusses how companies can reduce costs by reengineering product design or by reducing individual activity costs. Chapters 5, 14 and 16 present cost hierarchies. Chapter 15 examines capacity costing issues. Chapter 19 describes how activity-based costing can be used to manage quality.

6. Performance evaluation. Corporations have continued to innovate in their performance evaluation systems, placing greater emphasis on nonfinancial measures and combining these measures with financial measures. We describe performance evaluation considerations throughout the text, for example, when describing costing systems, variance analysis, relevant costs, overhead cost allocations, quality, productivity, and just-in-time. Chapter 26 develops a conceptual framework, based on recent research, for understanding performance evaluation issues.

Major Changes in Content and Sequence

1. The sequence of topics in Chapters 1 through 12 of the eighth edition is unchanged in the ninth edition, except that Process Costing previously introduced in Chapter 5 is instead presented comprehensively in Chapter 17. Material within these chapters is updated, reorganized, and integrated to facilitate student learning. For example, the discussion of cost hierarchies in Chapter 10 of the eighth edition is integrated with activity-based costing in Chapter 5 of the ninth edition; Chapters 4 and 5 streamline the presentation of job costing, cost-system refinements, and activity-based costing; and Chapter 10 on estimating cost functions and determining how costs behave is presented in a more graphical way.

2. The topics covered in the eighth edition Chapter 13 ("Management Control Systems") have been integrated into other chapters. Benchmarking is combined with variance analysis in Chapter 7; discretionary and engineered costs are described in an Appendix to Chapter 8 as an extension of overhead-variance analysis; value-added and nonvalue-added distinctions are discussed in the context of value engineering in Chapter 12; and management control issues are integrated with the transfer pricing discussion in Chapter 25.

3. Old Chapters 14 through 16 (on cost allocation and joint costs) are now Chapters 13 through 15.

4. Chapter 16 in the ninth edition is a new chapter that focuses on revenue management. Part One is new material on revenue tracing and revenue allocation. Part Two covers sales variances from old Chapter 22, and Part Three describes the customer profitability analysis from old Chapter 4.

5. Old Chapters 17 and 18 (on process costing and spoilage) continue as Chapters 17 and 18. However, the ninth edition introduces a new method for process costing. This method uses inventory-costing procedures that are virtually identical to inventory-costing methods, which students encountered in their introductory financial accounting classes. The only additional feature is the equivalent unit cost calculations.

6. Old Chapters 19 and 24 (on operation costing, backflush costing, inventory management, and just-in-time) have been reorganized into new Chapters 20 and 21 to achieve an expanded and integrated treatment of costing and cost management in a just-in-time environment.

7. Old Chapters 20 and 21 (on capital budgeting) are now Chapters 22 and 23. The new capital budgeting chapters include the topics of breakeven time (BET)

from old Chapter 23, control of projects from old Chapter 19, and expanded discussions of post-investment audits and tax aspects.

8. Old Chapter 22 (Part Two on input variances and Part Three on productivity measurement) is now Chapter 24.

9. Old Chapter 23 (on quality and time) is now Chapter 19. The discussion of quality cost management in new Chapter 19 builds on the accounting for spoilage, rework, and scrap in new Chapter 18.

10. Old Chapters 25 and 26 (on transfer pricing and performance evaluation) continue as Chapters 25 and 26 but with an expanded multinational flavor.

Assignment Material

The ninth edition continues the widely applauded tight linkage between text and assignment material formed in previous editions. We have also significantly expanded the assignment material, provided more structure, and added greater variety. Notable changes are as follows:

- ◆ End-of-chapter assignment material are divided into three groups: Exercises, Problems, and a Collaborative Learning Problem. Exercises are short, structured assignments that test basic issues presented in the chapter. Problems are longer and more difficult assignments. The Collaborative Learning Problem is the last assignment in each chapter. These problems are group assignments that require students to think critically about a particular problem or specific business situation.
- ◆ Each of the seven parts of the book has a video case. The video case covers and integrates material from the various chapters in that part. For example, Nally & Gibson Georgetown, Inc., a limestone mining and processing company, is used to illustrate cost allocation and process costing at the end of Part Four. Instructors can use these video cases and the accompanying photo walkthroughs to summarize major segments of the course and to challenge their students' comprehension of the topics covered in those segments.

ILLUSTRATIONS OF ACTUAL BUSINESSES

Students become highly motivated to learn cost accounting if they can relate the subject matter to the real world. We have spent considerable time interacting with the business community, investigating new uses of cost accounting data and gaining insight into how changes in technology are affecting the roles of cost accounting information. Real-world illustrations are found in many parts of the text.

Concepts in Action Boxes Found in many chapters, these boxes discuss how cost accounting concepts are applied by individual companies. Examples are drawn from many different countries, including the United States (Motorola on p. 15, Harley-Davidson on p. 41, General Motors on p. 68, Clark-Hurth on p. 149, Parker-Hannifin on p. 231), Canada (Ontario Hydro on p. 799), France (CFM International on p. 441), Germany (Porsche on p. 757), Japan (Nissan and Toyota on p. 441 and Japanese National Tax Agency on p. 916), Mexico (Crysel on p. 690), and the United Kingdom (Allied-Signal Skelmersdale on p. 700).

Surveys of Company Practice Boxes Results from surveys in more than 15 countries are cited in the many Surveys of Company Practice boxes found throughout the book. Examples include

- ◆ Growing Interest in Activity-Based Costing (p. 113)—cites evidence from the United States, Canada, the United Kingdom, and New Zealand.
- ◆ Budgeting Practices (p. 188)—cites evidence from the United States, Australia, Holland, Japan, and the United Kingdom.

- ◆ Standard Costing (p. 225)—cites evidence from the United States, Canada, Ireland, Japan, Sweden, and the United Kingdom.
- ◆ Variable Costing (p. 312)—cites evidence from the United States, Australia, Canada, Japan, Sweden, and the United Kingdom.
- ◆ Pricing Practices (p. 445)—cites evidence from the United States, Australia, Ireland, Japan, and the United Kingdom.
- ◆ Purposes of Cost Allocation (p. 490)—cites evidence from the United States, Australia, Canada, and the United Kingdom.
- ◆ Performance Measures in Just-in-Time Systems (p. 761)—cites evidence from the United States, Canada, Ireland, Italy, and the United Kingdom.
- ◆ Capital Budgeting Methods (p. 794)—cites evidence from the United States, Australia, Canada, Ireland, Japan, Poland, Scotland, South Korea, and the United Kingdom.
- ◆ Transfer Pricing Methods (p. 912)—cites evidence from the United States, Australia, Canada, India, Japan, New Zealand, and the United Kingdom.

This extensive survey evidence enables students to see that many of the concepts they are learning are widely used across the globe.

Photos from Actual Companies All chapters open with a photo that illustrates an important concept discussed in that chapter. These photos feature companies from many different countries, including the United States (Ben & Jerry's), Canada (Cott Corporation), and the United Kingdom (Tomkins, PLC). Each Concepts in Action box has an accompanying photo.

- ◆ Photo Walkthroughs are a new feature of the ninth edition. These appear at the end of each of the seven parts of the book and provide visual images of a manufacturing or business process described in that part. Visualizing a process helps students better understand the text descriptions. Video cases, tied to the photo essays, help students to further consolidate their thinking.

SUPPLEMENTS TO THE NINTH EDITION

A complete package of supplements is available to assist students and instructors in using this book. Supplements available to students include the following:

- ◆ *Student Guide and Review Manual* by John K. Harris and Dudley W. Curry.
- ◆ *Student Solutions Manual* by Charles T. Horngren, George Foster, and Srikant M. Datar.
- ◆ *Applications in Cost Accounting Using Excel* by David M. Buehlmann and Dennis P. Curtin.
- ◆ *Spreadsheet Templates* by Albert Fisher.

Supplements available to instructors include the following:

- ◆ *Annotated Instructor's Edition* with annotations by Linda S. Bamber.
- ◆ *Prentice Hall Course Manager*.
- ◆ *Instructor's Manual and Media Guide* by Michael C. Nibbelin.
- ◆ *Test Item File* by Marvin L. Bouillon.
- ◆ *Prentice Hall Custom Test* by ESA, Inc.
- ◆ *Solutions Manual* by Charles T. Horngren, George Foster, and Srikant M. Datar.
- ◆ *Solutions Transparencies*.
- ◆ *Solutions Manual for Applications in Cost Accounting Using Excel* by David M. Buehlmann and Dennis P. Curtin.

Supplements new to the ninth edition include the following:

- ◆ ***PH Professor: A Classroom Presentation on PowerPoint*** by William O. Stratton. Approximately 20 PowerPoint slides are available for each chapter of the text. This software allows instructors to offer an interactive presentation that uses colorful graphics, outlines of chapter material, additional examples, and graphical explanations of difficult topics. Some slides also have hidden spreadsheets that allow instructors to do what-if analyses for the situation being discussed in the slide. It is not necessary to have PowerPoint to run the presentations. However, if PowerPoint is available, you will be able to add, delete, revise, and change the order of the slides. Students may purchase a copy of *Power Notes*, which is a print out of all of the slides along with additional space for taking notes.
- ◆ ***Power Notes*** by William O. Stratton. This handy note-taking tool contains print-outs of all PowerPoint slides available for the text. Students can focus their attention on the lecture because they already possess the information on the slide. Extra space is provided next to each slide to jot down additional explanations, examples, and so on that are supplied by the instructor.
- ◆ ***CD-ROM—Career Paths in Accounting*** by Convergence Multimedia. With *Career Paths*, students can explore facts and trends in business, find out where the jobs are, and find out how to succeed in marketing themselves in the information age. Each CD-ROM contains 250 original video clips describing the nature of specific jobs, successful applicant profiles and entry requirements in today's volatile business world; interviews with key practitioners in the field; modules for preparing a winning resume, interviewing, networking, and negotiating; and interactive aptitude tests to determine skills and preferences.
- ◆ ***ABC News/PH Video Library for Cost Accounting***. Video is a dynamic way to enhance your class presentations. However, the quality of the video material and how well it relates to your course can still make all the difference. For these reasons, Prentice Hall and ABC News worked together to bring you the best and most comprehensive video ancillaries available in the college market.
- ◆ In addition to the *ABC News Videos*, and *ON LOCATION!* Videos, company-specific plant tours from Fortune 500 service and manufacturing companies are also provided. Through these videos your students are able to experience shop floors like Chrysler and AT&T.

Through its wide variety of award-winning programs—"Nightline," "Business World," "On Business," "This Week with David Brinkley," "World News Tonight," and "The Wall Street Journal Report"—ABC offers a resource for feature and documentary-style videos related to text concepts and applications. The programs have extremely high production quality, present substantial content, and are hosted by well-versed, well-known anchors. Prentice Hall—its authors and its editors—provides videos on topics that work well with this course and text and gives instructors teaching notes on using them in the classroom.

- ◆ ***ON LOCATION! Custom Case Videos for Cost Accounting***. Broadcast journalism and accounting education meet to create a series of custom produced case videos that have all the fast-paced and engaging qualities of TV and focus on the successful cost accounting activities of five dynamic companies. Take your students on a field trip to Dell Computers or Deer Valley Ski Resort to see the impact of cost accounting on their business strategies. Each video is approximately six to eight minutes in length and is tied directly to the issue-oriented end-of-part video case studies in *Cost Accounting*.

The ABC News/PH Video Library *ON LOCATION!* for *Cost Accounting* offers video material for almost every chapter in the text. An excellent video guide that is included in your *Instructor's Manual* carefully and completely integrates the videos into your lecture.

We are indebted to many for their ideas and assistance. Our primary thanks go to the many academics and practitioners who have advanced our knowledge of cost accounting.

The package of teaching material we present is the work of many skillful and valued team members. John K. Harris aided us immensely at all stages in the development and production of this book. He critiqued the eighth edition and gave a detailed review of the manuscript for the ninth edition. Linda S. Bamber reviewed the manuscript and gave suggestions for improvement in addition to working on the *Annotated Instructor's Edition*. Beverly Amer proved to be an invaluable resource in researching and writing the photo essays and video cases.

Professors providing detailed written reviews of the previous edition or comments on our drafts of this edition include

Tarek S. Amer, Northern Arizona University
 Charles D. Bailey, University of Central Florida
 Ken M. Boze, University of Alaska, Anchorage
 Somnath Das, University of California, Berkeley
 Peggy deProphetis, University of Pennsylvania
 Amin A. Elmallah, California State University, Sacramento
 David P. Franz, San Francisco State University
 James M. Fremgen, Naval Postgraduate School
 David O. Green, City University of New York-Baruch College
 Horace W. Harrell Jr., Georgia Southern University
 Cliff Harrison, Palliser Institute, Saskatchewan Institute of Applied Science and Technology
 Ennis Hawkins, Sam Houston State University
 Eleanor G. Henry, State University of New York, Oswego
 Jiunn C. Huang, San Francisco State University
 M. Zafar Iqbal, California Polytechnic State University, San Luis Obispo
 Holly H. Johnston, Boston University
 S. Joseph Lambert III, University of New Orleans
 Peter Luckett, University of New South Wales
 Frank F. S. Luh, Lehigh University
 Allan MacQuarrie, University of Massachusetts-Boston
 Gary J. Mann, University of Texas at El Paso
 C. Michael Merz, Boise State University
 Arijit Mukherji, University of Minnesota
 Lee H. Nicholas, University of Northern Iowa
 Manyong Park, Georgia State University
 Emanuel Schwarz, San Francisco State University, Emeritus
 Gim S. Seow, University of Connecticut
 Robert J. Shepherd, University of California, Santa Cruz and San Jose State University
 Harry Soltermann, Northern Alberta Institute of Technology
 William A. Stahlin, Drexel University
 Neil A. Wilner, University of North Texas
 Tony B. Wong, Northern Alberta Institute of Technology
 Russell Yerkes, Roosevelt University, Emeritus
 Marilyn T. Zarzeski, University of Central Florida

The faculty participating in the many focus groups on the eighth edition provided highly valued feedback. Many students provided helpful input on this and the previous edition, including Michael Clements, Susan Cohen, Donald Cram, Sheryl Powers, Ratna Sarkar, and Daniel Serra. In addition, we have received helpful suggestions from many users, unfortunately too numerous to be mentioned here. The ninth edition is much improved by the feedback and interest of all these people. We are very appreciative of this support.

Our association with CAM-I has been a source of much stimulation as well as enjoyment. CAM-I has played a pivotal role in extending the frontiers of knowledge on cost management. We appreciate our extended and continued interaction with Jim Brimson, Callie Berliner, Charles Marx, R. Steven Player, Tom Pryor, Mike Roberts, and Pete Zampino.

We thank the people at Prentice Hall. Katherine Evancie (the managing editor) and David Cohen (the development editor) greatly exceeded their calls of duty in producing and developing a quality book in a timely fashion. Many others at Prentice Hall gave important assistance, including Jane Avery, P. J. Boardman, Diane deCastro, Patti Dant, Lisa DiMaulo, Deborah Hoffman Emry, Richard Wohl, Pat Wosczyk, Elaine Mast, Robert Prokop, Suzanne Behnke, Renée Pelletier, Paul Smolenski, Vincent Scelta, Joanne Jay, Richard Breten, Joe Tomasso, Veronica Schwartz, Steve Deitmer, Janet Ferruggia, and Ruta Fiorino.

Jirane Tongudai managed the production aspects of all the manuscript preparation with superb skill and much grace. Her capacity and willingness to handle the many tasks never wavered. We are deeply appreciative of her good spirits, loyalty, and ability to stay calm in the most hectic of times. We also appreciate the help of Mathew Lonergan and Jeannette Ochoa.

Appreciation also goes to the American Institute of Certified Public Accountants, the Institute of Management Accountants, the Society of Management Accountants of Canada, the Certified General Accountants Association of Canada, the Financial Executive Institute of America, and many other publishers and companies for their generous permission to quote from their publications. Problems from the Uniform CPA examinations are designated (CPA); problems from the Certificate in Management Accounting examinations are designated (CMA); problems from the Canadian examinations administered by the Society of Management Accountants are designated (SMA); problems from the Certified General Accountants Association are designated (CGA). Many of these problems are adapted to highlight particular points.

We are grateful to the professors who contributed assignment material for this edition. Their names are indicated in parentheses at the start of their specific problems.

Comments from users are welcome.

CHARLES T. HORNGREN
GEORGE FOSTER
SRIKANT M. DATAR

TO OUR FAMILIES

Joan, Scott, Mary, Susie, Cathy (CH)

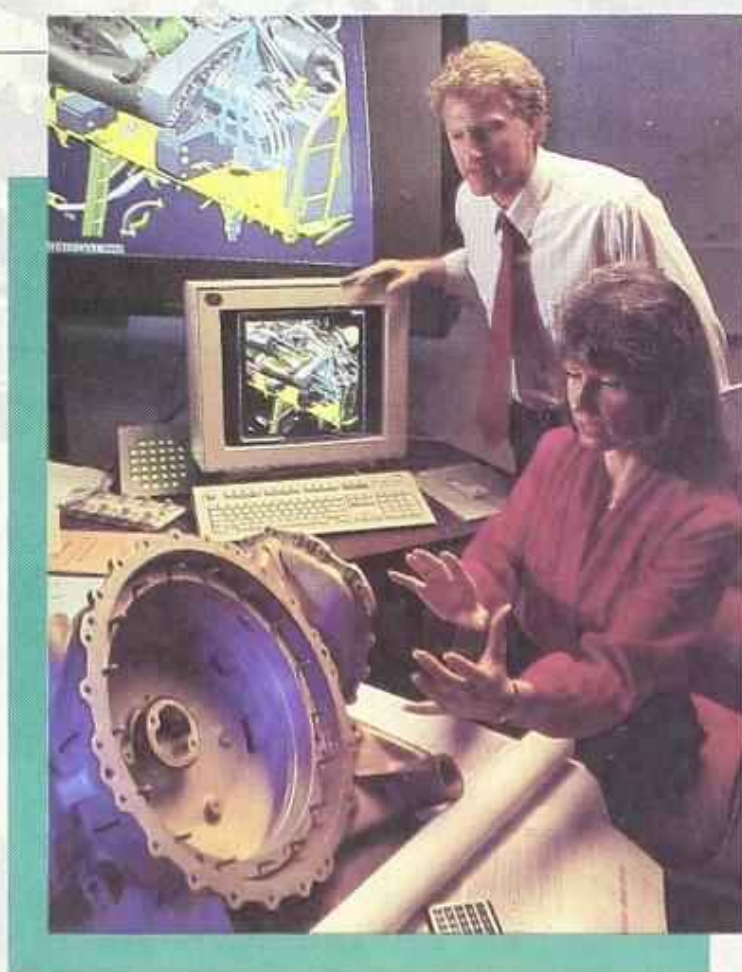
The Foster Family (GF)

Swati, Radbika, Gayatri, Sidharth (SD)

1

CHAPTER

THE ACCOUNTANT'S ROLE IN THE ORGANIZATION



Modern cost management emphasizes the role of research and development and product design as well as other areas of the value chain such as production and marketing. Textron uses “Integrated Product Teams” with members from all areas of the value chain at its Bell-Boeing Aircraft facility to reduce product costs and aircraft weight while increasing quality.

LEARNING OBJECTIVES

After studying this chapter, you should be able to

1. Identify five broad purposes of accounting systems
2. Describe cost accounting and its relationship to management accounting and financial accounting
3. Describe the set of business functions in a value chain
4. Understand how accounting can facilitate planning, control, and decision making
5. Describe the difference between line management and staff management
6. Distinguish among the scorekeeping, attention-directing, and problem-solving functions of the controller
7. Understand the importance of professional ethics to management accountants
8. Describe evolving management themes that are shaping developments in management accounting systems

OBJECTIVE 1

Identify five broad purposes of accounting systems

Former accountants currently are senior executives in many large companies, including Coca-Cola, Nike, PepsiCo, Bell Canada, Cadbury Schweppes, and Nissan Motors. Accounting provides a superb training field for executives because it cuts across all facets of the organization. The accountant's duties are intertwined with management planning, control, and decision making.

The study of modern cost accounting yields numerous insights into both the manager's and the accountant's role in an organization. What types of decisions do managers make? How can accounting help managers make these decisions? This book addresses these questions. In this chapter we look at where the accountant fits in the organization; this will give us a framework for studying the succeeding chapters.

THE MAJOR PURPOSES OF ACCOUNTING SYSTEMS

The accounting system is the principal—and the most credible—quantitative information system in almost every organization. This system should provide information for five broad purposes:

- ◆ *Purpose 1: Formulating overall strategies and long-range plans.* This includes new product development and investment in both tangible (equipment) and intangible (brands, patents, or people) assets, and frequently involves special purpose reports.
- ◆ *Purpose 2: Resource allocation decisions such as product and customer emphasis and pricing.* This frequently involves reports on the profitability of products or services, brand categories, customers, distribution channels, and so on.
- ◆ *Purpose 3: Cost planning and cost control of operations and activities.* This involves reports on revenues, costs, assets, and the liabilities of divisions, plants, and other areas of responsibility.
- ◆ *Purpose 4: Performance measurement and evaluation of people.* This includes comparisons of actual results with planned results. It can be based on financial or nonfinancial measures.
- ◆ *Purpose 5: Meeting external regulatory and legal reporting requirements.* Regulations and statutes typically prescribe the accounting methods to be followed here. Consider financial reports that are provided to shareholders who are making decisions to buy, hold, or sell shares in the company. These reports must follow generally accepted accounting principles, as heavily influenced by regulatory bodies such as the Financial Accounting Standards Board in the United States or the Accounting Standards Board in Canada.

Each of the purposes stated here may require a different presentation or reporting method. An ideal data base for presentations and reports (sometimes called a data warehouse or infobarn) is very detailed and cuts across business functions. Accountants combine or adjust ("slice or dice") these data to answer the questions from particular internal or external users.

Management Accounting, Financial Accounting, and Cost Accounting

OBJECTIVE 2

Describe cost accounting and its relationship to management accounting and financial accounting

A distinction is often made in practice between management accounting and financial accounting. **Management accounting** measures and reports financial information as well as other types of information that assist managers in fulfilling the goals of the organization. It is thus concerned with purposes 1–4. **Financial accounting** focuses on external reporting that is guided by generally accepted accounting principles. It is thus concerned with purpose 5. **Cost accounting** measures and reports financial and other information related to the organization's acquisition or consumption of resources. It provides information for both management accounting and financial accounting.

Financial accounting, as mentioned, is constrained by generally accepted accounting principles. These principles restrict the set of revenue and cost measure-

ment rules and the types of items that are classified as assets, liabilities, or owners' equity in balance sheets. In contrast, management accounting is not restricted to those accounting principles acceptable for financial reporting. For example, for purposes 3 and 4, a consumer products company may present a particular estimated "value" of a brand name (say, the Coca-Cola brand name) in its *internal* financial reports for marketing managers, although doing so is not in accordance with generally accepted accounting principles.

Do not assume that management accounting focuses exclusively on internal parties. Managers are increasingly sharing accounting information with external parties such as suppliers and customers.

Cost Management and Accounting Systems

A central task of managers is *cost management*. We use **cost management** to describe the actions managers undertake to satisfy customers while continuously reducing and controlling costs. The Toyota Motor Company in a recent Annual Report noted that

Cost management is . . . for the automobile industry in the 1990s what quality control was in the 1970s and 80s.

An important component of cost management is the recognition that prior management decisions often commit the organization to the subsequent incurrence of costs. Consider the costs of handling materials in a production plant. Decisions about plant layout and the extent of physical movement of materials required for production typically are made before production begins. These decisions greatly influence the level of day-to-day materials-handling costs once production begins.

MODERN COST ACCOUNTING

Managers as Customers of Accounting

Managers around the globe are becoming increasingly aware of the importance of the quality and timeliness of products and services sold to their external customers. In turn, accountants are becoming increasingly sensitive to the quality and timeliness of accounting information required by managers. For example, a management accounting group at Johnson & Johnson (the manufacturer of many consumer products, such as Band Aids) has a vision statement that includes the phrases "delight our customers" and "be the best." The success of management accounting depends on whether managers' decisions are improved by the accounting information provided to them.

The Value Chain of Business Functions

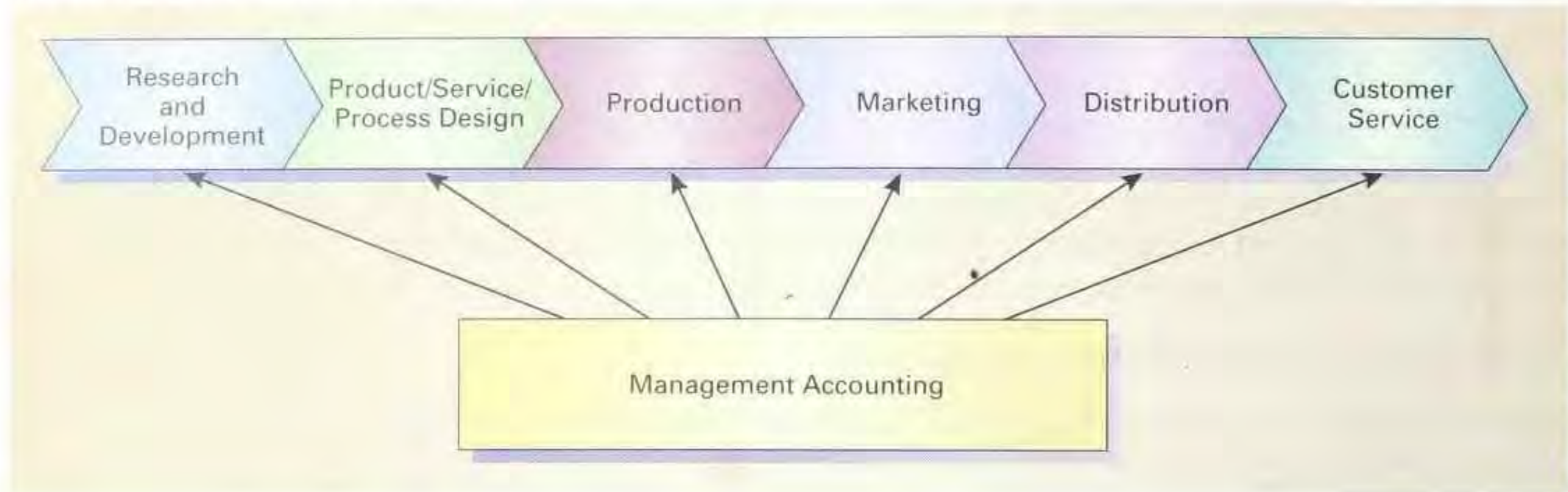
Throughout this book we organize our look at organizations by using the value chain of the business functions, which appears as Exhibit 1-1. The **value chain** is the sequence of business functions in which utility (usefulness) is added to the products or services of an organization. These functions are as follows:

- ◆ **Research and development (R&D)**—the generation of, and experimentation with, ideas related to new products, services, or processes.
- ◆ **Design of products, services, or processes**—the detailed planning and engineering of products, services, or processes.
- ◆ **Production**—the coordination and assembly of resources to produce a product or deliver a service.
- ◆ **Marketing**—the manner by which individuals or groups (a) learn about and value the attributes of products or services, and (b) purchase those products or services.
- ◆ **Distribution**—the mechanism by which products or services are delivered to the customer.
- ◆ **Customer service**—the support activities provided to customers.

OBJECTIVE 3

Describe the set of business functions in a value chain

EXHIBIT 1-1
The Value Chain of Business Functions



Do not interpret Exhibit 1-1 as implying that managers should proceed sequentially through the value chain. There are important gains to be realized (in terms of, say, cost, quality, and the speed with which new products are developed) from having the individual parts of the value chain work concurrently.

Senior managers of an organization (including those from individual parts of the value chain) have the responsibility of deciding on its overall strategy, how resources are to be obtained and used, and how rewards are to be given. This task covers the entire value chain.

Accounting is a major means of helping managers to administer each of the business functions presented in Exhibit 1-1 and to coordinate their activities within the framework of the organization as a whole. This book focuses on how accounting does in fact assist managers in these tasks.

ELEMENTS OF MANAGEMENT CONTROL

OBJECTIVE 4

Understand how accounting can facilitate planning, control, and decision making

Is Microsoft's management control system better than Novell's? Is Nestlé's better than Cadbury's? This section provides an overview of management control systems, illustrating the role of accounting information.

Planning and Control

There are countless definitions of planning and control. Study the left side of Exhibit 1-2, which uses planning and control at *The Daily Sporting News* (DSN) as an illustration. We define **planning** (the top box) as choosing goals, predicting results under various ways of achieving those goals, and then deciding how to attain the desired goals. For example, one goal of DSN may be to increase operating income. Three main alternatives are considered to achieve this goal:

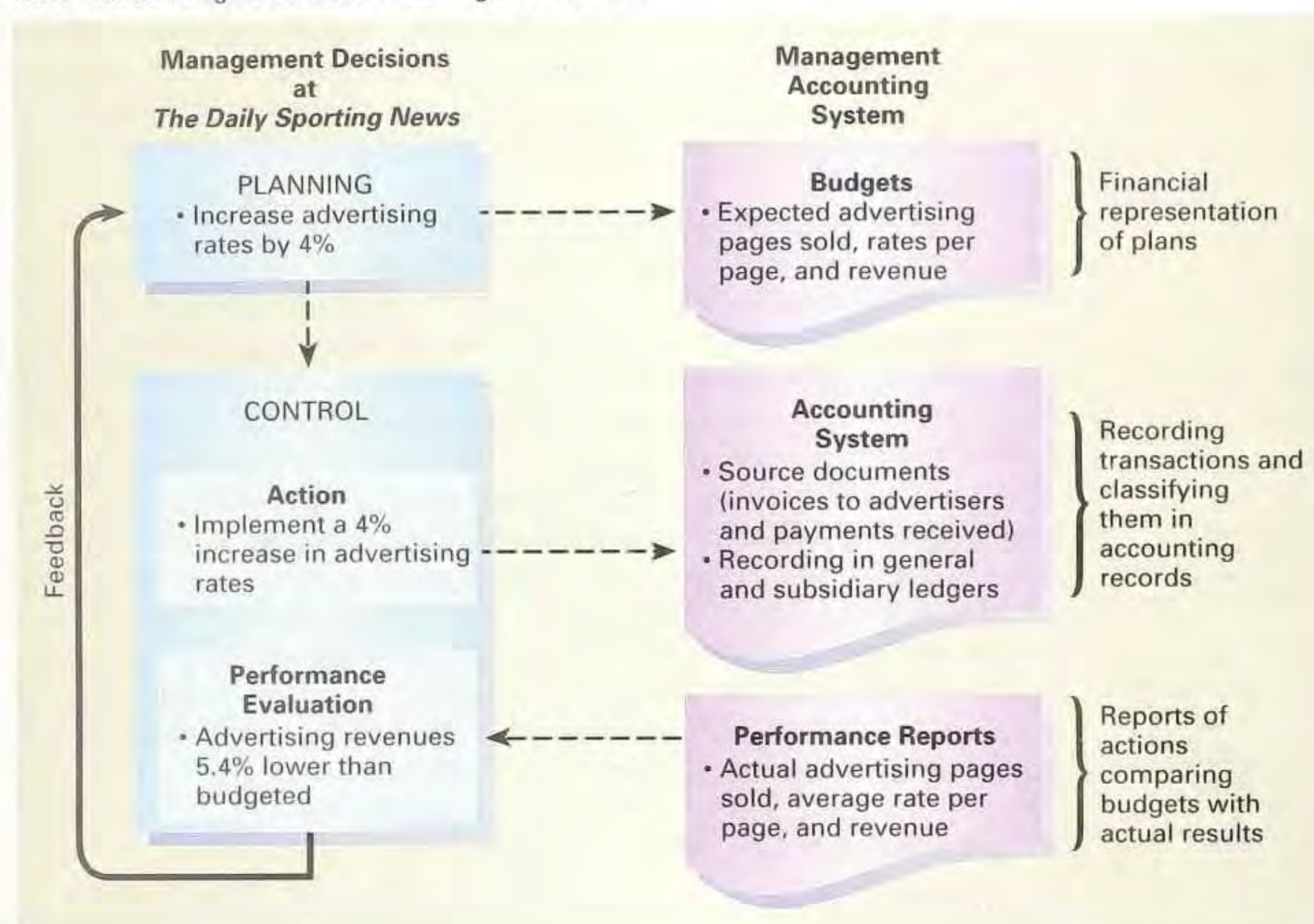
1. Change the price per newspaper.
2. Change the rate per page charged to advertisers.
3. Reduce labor costs by having fewer workers at DSN's printing facility.

Assume that the publisher, Naomi Crawford, increases advertising rates by 4% to \$5,200 per page for March 19_7. She budgets advertising revenue to be \$4,160,000 ($\$5,200 \times 800$ pages predicted to be sold in March 19_7). A **budget** is the quantitative expression of a plan of action and an aid to the coordination and implementation of the plan.

Control (the bottom box in Exhibit 1-2) covers both the action that implements the planning decision and the performance evaluation of the personnel and operations. With our DSN example, the action would include communicating the new advertising-rate schedule to DSN's marketing sales representatives and advertisers. The performance evaluation provides feedback on the actual results.

EXHIBIT 1-2

How Accounting Facilitates Planning and Control



During March 19_7, DSN sells advertising, sends out invoices, and receives payments. These invoices and receipts are recorded in the accounting system. Exhibit 1-3 shows the March 19_7 advertising revenue performance report for DSN. This report indicates that 760 pages of advertising (40 pages less than the budgeted 800 pages) were sold in March 19_7. The average rate per page was \$5,080 compared with the budgeted \$5,200 rate, yielding actual advertising revenue in March 19_7 of \$3,860,800. The actual advertising revenue in March 19_7 is \$299,200 less than the budgeted \$4,160,000. Understanding the reasons for any difference between actual results and budgeted results is an important part of **management by exception**, which is the practice of concentrating on areas not operating as expected (such as a cost overrun on a project) and placing less attention on areas operating as expected. The term **variance** in Exhibit 1-3 refers to the difference between the actual results and the budgeted amounts.

The performance report in Exhibit 1-3 could spur investigation. For example, did other newspapers experience a comparable decline in advertising revenue? Did the marketing department make sufficient efforts to convince advertisers that, even with the new rate of \$5,200 per page, advertising in the DSN was a good buy? Why was the actual average rate per page \$5,080 instead of the budgeted rate of \$5,200? Did some sales representatives offer discounted rates? Did a major advertiser threaten to transfer its advertising to another newspaper unless it was given a large rate per page reduction? Answers to these questions could prompt Crawford to take

EXHIBIT 1-3

Advertising Revenue Performance Report at *The Daily Sporting News* for March 19_7

	Actual Results	Budgeted Amounts	Variance
Advertising Pages Sold	760	800	40 unfavorable
Average Rate Per Page	\$5,080	\$5,200	\$120 unfavorable
Advertising Revenue	\$3,860,800	\$4,160,000	\$299,200 unfavorable

subsequent actions, including, for example, pushing marketing personnel to renew efforts to promote advertising by existing and potential advertisers.

A well-conceived plan includes enough flexibility so that managers can seize opportunities unforeseen at the time the plan is formulated. In no case should control mean that managers cling to a preexisting plan when unfolding events indicate that actions not encompassed by the original plan would offer the best results to the company.

Planning and control are so strongly intertwined that managers do not spend time drawing artificially rigid distinctions between them. Unless otherwise stated, we use control in its broadest sense to denote the entire management process of both planning and control. For example, instead of referring to a management planning and control system, we will refer to a management control system. Similarly, we will often refer to the control purpose of accounting instead of the awkward planning and control purpose of accounting.

Do not underestimate the role of individuals and groups in management control systems. Both accountants and managers should always remember that management control systems are not confined exclusively to technical matters such as the type of computer systems used and the frequency with which reports are prepared. Management control is primarily a human activity that should focus on how to help individuals do their jobs better. For example, it is often better for managers to personally discuss with underperforming workers how to improve performance rather than just sending those workers a report highlighting their underperformance.

Feedback: A Major Key

Exhibit 1-2 (p. 5) shows a feedback loop from control back to planning. Feedback involves managers examining past performance and systematically exploring alternative ways to improve future performance. It can lead to a variety of responses, including the following:

USE OF FEEDBACK	EXAMPLE
◆ Changing goals.	◆ Continental Airlines increases emphasis on cash flow rather than income, after prior liquidity problems led to bankruptcy.
◆ Searching for alternative means of operating.	◆ London University Hospital compares internal processing versus third-party managing (outsourcing) of its accounts receivable operations.
◆ Changing methods for making decisions.	◆ Chrysler adopts a team-based new product development process with input from both manufacturing and marketing.
◆ Making predictions.	◆ British Columbia Telecom incorporates average inflation forecasts for wages when predicting future labor costs.
◆ Changing operations.	◆ Sony has materials delivered directly to the assembly floor instead of to a storeroom.
◆ Changing the reward system.	◆ IBM considers basing its marketing bonuses on the profitability of sales rather than on the dollar amount of sales.

COST-BENEFIT APPROACH

This book takes a general approach to accounting, which is referred to as the **cost-benefit approach**. That is, the primary criterion for choosing among alternative accounting systems is how well they help achieve organizational goals in relation to the costs of those systems.

As customers, managers buy a more elaborate management accounting system when its perceived expected benefits exceed its perceived expected costs. Although

the benefits may take many forms, they can be summarized as the collective set of decisions that will better attain organizational goals.

Consider the installation of a company's first budgeting system. Previously the company had probably been using some historical recordkeeping and little formal planning. A major benefit of installing the budgeting system is that it compels managers to plan more formally. They may make a different, more profitable set of decisions than would have been done by using only a historical system. Thus the expected benefits exceed the expected costs of the new budgeting system. These costs include investments in computer hardware and software, in training people, and in ongoing operating costs of the system.

Admittedly, the measurement of these costs and benefits is seldom easy. Therefore, you may want to call this approach a conceptual rather than a practical guide. Nevertheless, the cost-benefit approach provides a starting point for analyzing virtually all accounting issues.

ORGANIZATION STRUCTURE AND THE MANAGEMENT ACCOUNTANT

Line and Staff Relationships

Most organizations distinguish between line and staff management. **Line management** is directly responsible for attaining the objectives of the organization. For example, managers of manufacturing divisions may have objectives for a specified amount of operating income plus targets for product quality, safety, and compliance with environmental laws. **Staff management**, such as management accountants, exists to provide advice and assistance to line management. For example, a plant manager (a line function) may be responsible for investing in new equipment. A plant management accountant (a staff function) may prepare detailed operating-cost comparisons for potential pieces of equipment.

Increasingly, organizations are emphasizing the importance of teams in promoting their objectives. These teams often include both line and staff management with the result that the traditional distinctions between line and staff are less clear-cut than they were a decade ago. Line management and staff management designations are best viewed as different ends of a spectrum.

The Chief Financial Officer and the Controller

The **chief financial officer (CFO)**—also called the **finance director**—is the senior officer empowered with overseeing the financial operations of an organization. The responsibilities of the CFO vary among organizations, but they almost always encompass the following four areas:

- ◆ *Controllership* includes providing financial information for both reports to managers and reports to investors.
- ◆ *Treasury* includes short- and long-term financing, banking, and foreign exchange and derivatives management.
- ◆ *Tax* includes income taxes, sales taxes, and international tax planning.
- ◆ *Internal audit* includes reviewing and analyzing the financial records and other records to attest to the integrity of its financial reports and adherence to the organization's policies and procedures.

In some organizations, the CFO also has responsibility for information systems. In other organizations, an officer of equivalent rank to the CFO—termed *chief information officer*—has responsibility for information systems.

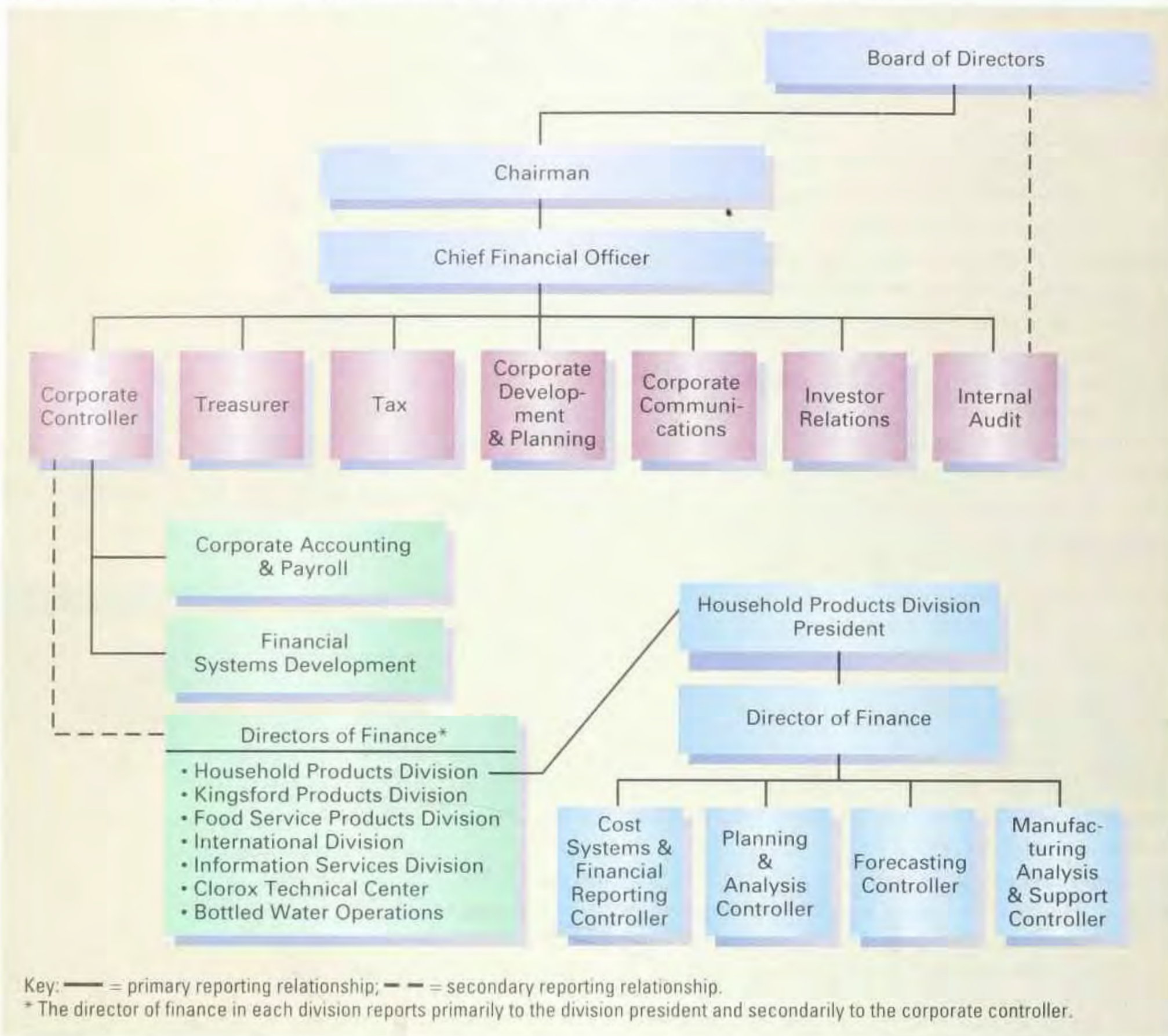
The **controller** is the financial executive primarily responsible for both management accounting and financial accounting. This book focuses on the management accounting function of the controller. The modern controller does not do any controlling in terms of line authority except over his or her own department. Yet the

OBJECTIVE 5

Describe the difference between line management and staff management

EXHIBIT 1-4

The Clorox Company: Reporting Relationships for the CFO and the Corporate Controller



modern concept of controllership maintains that the controller does control in a special sense. That is, by reporting and interpreting relevant data, the controller exerts a force or influence that impels management toward making better informed decisions.

Exhibit 1-4 presents an organization chart showing the reporting responsibilities of the CFO and the corporate controller at the Clorox Company. Clorox is a leading bleach-producing company and also has major brands in charcoal and salad dressing. The CFO is a staff management function that reports to the most senior line managers (who in turn report to the board of directors). As in most organizations, the corporate controller at Clorox reports to the CFO. Organization charts like that in Exhibit 1-4 show formal reporting relationships. In most organizations, informal relationships also exist that are essential to understand when managers attempt to implement their decisions.

OBJECTIVE 6

Distinguish among the scorekeeping, attention-directing, and problem-solving functions of the controller

Scorekeeping, Attention-Directing, and Problem-Solving Functions

Management accountants perform three important functions—scorekeeping, attention directing, and problem solving.

- ◆ **Scorekeeping**—accumulating data and reporting reliable results to all levels of management. Examples are the recording of sales, purchases of materials, and payroll payments.

- ◆ **Attention directing**—making visible both opportunities and problems on which managers need to focus. Examples are highlighting rapidly growing markets where the company may be underfunding its investment and highlighting products with higher-than-expected rework rates or customer-return rates. Attention directing should focus on all opportunities to add value to an organization and not just on cost-reduction opportunities.
- ◆ **Problem solving**—comparative analysis to identify the best alternatives in relation to the organization's goals. An example is comparing the financial advantages of leasing a fleet of vehicles rather than owning those vehicles.

Accountants serving the scorekeeping function accumulate data and report the results to all levels of management. Accountants serving this function are responsible for the reliability of the reported information. In this regard, accountants are watchdogs for top management. The scorekeeping function in many organizations requires processing numerous data items (millions of items in some cases). The mechanics of the task should be well understood by those handling it and executed as flawlessly as possible.

Many organizations now have management accountants who concentrate solely on the attention-directing or problem-solving function. The titles of these individuals differ. As shown in Exhibit 1-4, Clorox has special staff positions for “cost systems and financial reporting,” “planning and analysis,” “forecasting,” and “manufacturing analysis and support.” The Yoplait Company, the French yogurt company, has staff positions for “operations analysis,” “budget analysis and reporting,” and “marketing and sales analysis.”

Many controllers' departments actively promote their attention-directing and problem-solving abilities to their internal customers in the organization. For example, Swissair's corporate controller's group was reorganized so that each of the 13 staff members in the group was assigned responsibility for assisting an individual Swissair division (such as engineering and maintenance, flight services, and marketing for Europe). Their challenge was to demonstrate to the managers of each division the value of their assistance in areas such as financial analysis, the budgeting process, and cost management.

PROFESSIONAL ETHICS

Ethical Guidelines

Professional accounting organizations representing management accountants exist in many countries. Appendix D discusses professional organizations in the United States, Canada, Australia, Japan, and the United Kingdom. Each of these organizations provides certification programs. For example, the **Institute of Management Accountants (IMA)**—the largest association of management accountants in the United States—provides a program leading to the **Certified Management Accountant (CMA)** certificate. This certificate signals that the holder has passed the admission criteria and demonstrated the competency of technical knowledge required by the IMA.

Accountants consistently rank high in public opinion surveys on the ethics exhibited by members of different professions. Professional accounting organizations play an important role in promoting a high standard of ethics. The IMA has issued a *Standards of Ethical Conduct for Management Accountants*. Exhibit 1-5 presents the IMA's guidance on issues relating to competence, confidentiality, integrity, and objectivity.

Typical Ethical Challenges

Ethical issues can confront management accountants in many ways. The following examples are illustrative.

OBJECTIVE 7

Understand the importance of professional ethics to management accountants

EXHIBIT 1-5

Standards of Ethical Conduct for Management Accountants

Management accountants have an obligation to the organizations they serve, their profession, the public, and themselves to maintain the highest standards of ethical conduct. In recognition of this obligation, the Institute of Certified Management Accountants and the Institute of Management Accountants have adopted the following standards of ethical conduct for management accountants. Adherence to these standards is integral to achieving the objectives of management accounting. Management accountants shall not commit acts contrary to these standards, nor shall they condone the commission of such acts by others within their organizations.

COMPETENCE

Management accountants have a responsibility to

- ◆ Maintain an appropriate level of professional competence by ongoing development of their knowledge and skills.
- ◆ Perform their professional duties in accordance with relevant laws, regulations, and technical standards.
- ◆ Prepare complete and clear reports and recommendations after appropriate analysis of relevant and reliable information.

CONFIDENTIALITY

Management accountants have a responsibility to

- ◆ Refrain from disclosing confidential information acquired in the course of their work except when authorized, unless legally obligated to do so.
- ◆ Inform subordinates as appropriate regarding the confidentiality of information acquired in the course of their work and monitor their activities to assure the maintenance of that confidentiality.
- ◆ Refrain from using or appearing to use confidential information acquired in the course of their work for unethical or illegal advantage either personally or through third parties.

INTEGRITY

Management accountants have a responsibility to

- ◆ Avoid actual or apparent conflicts of interest and advise all appropriate parties of any potential conflict.
- ◆ Refrain from engaging in any activity that would prejudice their ability to carry out their duties ethically.
- ◆ Refuse any gift, favor, or hospitality that would influence or would appear to influence their actions.
- ◆ Refrain from either actively or passively subverting the attainment of the organization's legitimate and ethical objectives.
- ◆ Recognize and communicate professional limitations or other constraints that would preclude responsible judgment or successful performance of an activity.
- ◆ Communicate unfavorable as well as favorable information and professional judgments or opinions.
- ◆ Refrain from engaging in or supporting any activity that would discredit the profession.

OBJECTIVITY

Management accountants have a responsibility to

- ◆ Communicate information fairly and objectively.
- ◆ Disclose fully all relevant information that could reasonably be expected to influence an intended user's understanding of the reports, comments, and recommendations presented.

Source: Institute of Management Accounting, *Standards of Ethical Conduct for Management Accountants* (Montvale, N.J.).

- ◆ **Case A** A management accountant, knowing that reporting a loss for a software division will result in yet another “rightsizing initiative” (a euphemism for layoffs), has concerns about the commercial viability of software for which R&D costs are currently being capitalized. The division manager argues vehemently that the new product will be a “winner” but has no credible evidence to support the opinion. The last two products from this division have not been successful in the market. The management accountant has many friends in the division and wants to avoid a personal confrontation with the division manager. Should the management accountant require the R&D to be expensed immediately due to the lack of evidence as to its commercial viability?
- ◆ **Case B** A packaging supplier, bidding for a new contract, offers the management accountant of its customer an all-expenses-paid weekend to the Superbowl. The supplier does not mention the new contract when making the invitation. The accountant is not a personal friend of the supplier. He knows operating-cost issues are critical in approving the new contract and is concerned that the supplier will ask details about bids by competing packaging companies.

In each case the management accountant is faced with an ethical challenge. Case A involves competence, objectivity, and integrity, whereas case B involves confidentiality and integrity. Ethical issues are not always black or white. For example, the supplier in case B may have no intention of raising issues associated with the bid. However, the appearance of a conflict of interest in case B is sufficient for many companies to prohibit employees from accepting free “favors” from suppliers. Exhibit 1-6 presents the IMA’s guidelines on resolution of ethical conflict.

A survey of 1,500 members of the Australian Society of Accountants found the following to be among the most frequently encountered ethical issues:

1. Proposals by clients or managers for tax evasion.
2. Conflicts of interest.
3. Proposals to manipulate financial statements.
4. Integrity in admitting mistakes made by oneself.
5. Coping with superior’s instructions to carry out unethical acts.¹

Most professional accounting organizations around the globe issue statements about professional ethics. While these statements include many of the same issues discussed by the IMA in Exhibits 1-5 and 1-6, differences do exist in their content. For example, the Chartered Institute of Management Accountants (CIMA) in the United Kingdom identifies the same four fundamental principles as the IMA did in Exhibit 1-5—competency, confidentiality, integrity, and objectivity. Yet, while the IMA code states that “except where legally prescribed, communication of such problems to authorities or individuals not employed or engaged by the organization is not considered appropriate,”² the CIMA code permits the accountant to hire an independent legal counsel if the issue cannot be resolved internally.

¹P. Leung and B. J. Cooper, “Ethical Dilemmas in Accountancy Practice,” *The Australian Accountant* (May 1995).

²R. L. Madison and J. R. Boafright, “Comparing IMA and CIMA Ethical Standards,” *Management Accounting* (April 1995).

EXHIBIT 1-6

Resolution of Ethical Conflict

In applying the standards of ethical conduct, management accountants may encounter problems in identifying unethical behavior or in resolving an ethical conflict. When faced with significant ethical issues, management accountants should follow the established policies of the organization bearing on the resolution of such conflict. If these policies do not resolve the ethical conflict, management accountants should consider the following course of action:

- ◆ Discuss such problems with the immediate superior except when it appears that the superior is involved, in which case the problem should be presented initially to the next higher managerial level. If satisfactory resolution cannot be achieved when the problem is initially presented, submit the issues to the next higher managerial level.

If the 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 the owners. Contact with levels above the immediate superior should be initiated only with the superior's knowledge, assuming the superior is not involved.

- ◆ Clarify relevant concepts by confidential discussion with an objective advisor to obtain an understanding of a possible course of actions.
- ◆ If the ethical conflict still exists after exhausting all levels of internal review, the management accountant may have no other recourse on significant matters other than to resign from the organization and to submit an informative memorandum to an appropriate representative of the organization.

Except where legally prescribed, communication of such problems to authorities or individuals not employed or engaged by the organization is not considered appropriate.

Source: Institute of Management Accountants, *Statements on Management Accounting: Objectives of Management Accounting, Statement No. 1B*, (Montvale, N.J.).

NEWLY EVOLVING MANAGEMENT THEMES AROUND THE GLOBE

OBJECTIVE 8

Describe evolving management themes that are shaping developments in management accounting systems

Management accounting exists to help managers make better decisions. Changes in the way managers operate require reevaluating the design and operation of the management accounting systems themselves. Exhibit 1-7 presents key themes in the new management approach.

1. *Customer satisfaction is priority one.* This theme is central. Customers are pivotal to the success of an organization. The number of organizations aiming to be "customer-driven" is large and increasing. The organization chart of Furon (a manufacturer of polymer) in Exhibit 1-8 shows how the customer is positioned at the apex of its organizational structure.

We discuss this theme in Chapter 16 when we look at customer profitability analysis and Chapter 26 when we address customer feedback in performance measures.

2. *Key success factors.* Customers are demanding ever-improving levels of performance regarding several (or even all) of the following factors:

Common Ethical Dilemmas and Codes of Ethics

Ethical dilemmas occur in many areas. Kirk Hanson, a noted scholar in business ethics, lists the following as most common:

- ◆ When the boss asks you to do something questionable or unethical
- ◆ When you have knowledge of the unethical actions of others
- ◆ When you are tempted to cut corners to meet your performance goals
- ◆ When you are tempted to oversell your product to close the deal
- ◆ When disclosing confidential information will greatly help your career or your company
- ◆ When you are tempted to cover up past subperformance

One survey found 83% of U.S., 68% of Canadian, and 50% of European companies have instituted codes of ethics. Examples of issues covered in these ethics statements are

- ◆ Fundamental guiding principles—for example, Vulcan Materials states, "Integrity: We will work constantly to earn the respect and trust of all parties we interact with by acting fairly and honorably."
- ◆ Purchasing guidelines—Provident Mutual states, "Employees may not give or receive anything of more than token value (\$50 or more) to or from any individual or organization with whom Provident Mutual does business."
- ◆ Environmental and safety guidelines—Neste OY states, "Our aim is to develop the best possible solutions in terms of the environment, occupational safety, and product user safety."

Other issues covered in codes of ethics statements include proprietary information, intellectual property, and confidentiality of employee records.

Source: K. O. Hanson, "Unavoidable Ethical Dilemmas in a Business Career" (Stanford University, 1995) and R. E. Berenbeim, *Corporate Ethics Practices* (New York: The Conference Board, 1992).

EXHIBIT 1-7

Key Themes in the New Management Approach

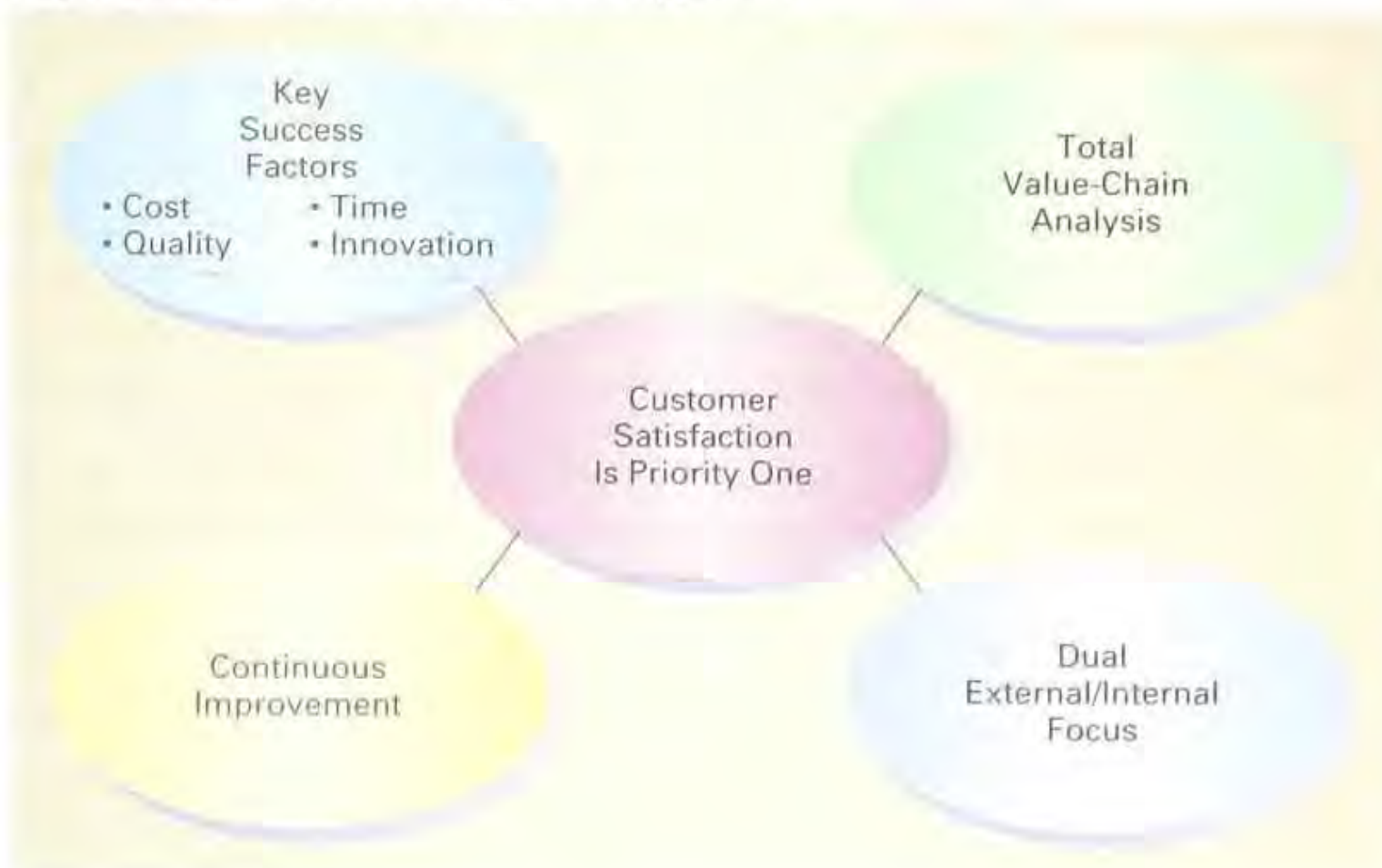


EXHIBIT 1-8

The Pivotal Position of Customers in the Organization Chart of the Furon Corporation



- ◆ *Cost.* Organizations are under continuous pressure to reduce the cost of the products or services they sell to their customers.
- ◆ *Quality.* Customers are expecting higher levels of quality and are less tolerant of low quality than in the past.
- ◆ *Time.* Time has many components, including the time taken to develop and bring new products to market, the speed at which an organization responds to customer requests, and the reliability with which promised delivery dates are met. Organizations are under pressure to complete activities faster and to meet promised delivery dates more reliably than in the past in order to increase customer satisfaction.
- ◆ *Innovation.* There is heightened recognition that a continuing flow of innovative products or services is a prerequisite for the ongoing success of most organizations.

Factors that directly affect customer satisfaction, such as cost, quality, time, and innovative products and services, are termed **key success factors**.

We discuss this theme in Chapters 4 and 5 when we address using activity-based costing to guide cost reductions and in Chapter 19 when we examine cost of quality reports.

3. *Total value-chain analysis.* This theme has two related aspects:

- ◆ Treating each area of the business functions in Exhibit 1-1 (p. 4) as an essential and valued contributor
- ◆ Integrating and coordinating the efforts of all business functions in addition to developing the capabilities of each individual business function

Total value-chain analysis means focusing on all the business functions related to a product or service from its cradle to its grave (“womb to tomb”), irrespective of whether those functions occur in the same organization or in a set of legally independent organizations. For example, Pepsi-Cola bottlers work with their materials suppliers to reduce Pepsi’s materials-handling costs. Similarly, Fujitsu works with the customers of its microchip division to better plan its production scheduling of microchips.

We discuss this theme in Chapter 6 as we look at budgeting and Chapter 12 when we address target costing.

4. *Continuous improvement.* Continuous improvement by competitors creates a never-ending search for higher levels of performance within many organizations. Phrases such as the following capture this theme:

Quality in Accounting at Motorola

Providing a quality product or service is often defined in terms of consistently meeting or exceeding customers' expectations. Motorola, a \$20 billion global company, is a winner of many awards for the quality of its products. The accounting group at Motorola views Motorola managers as its customers and is constantly seeking ways to meet or exceed their expectations. Consider the timeliness of the financial reports. Motorola managers place a premium on receiving timely reports. For many years, monthly results were not available to managers until 8 working days after month end. While an 8 working day "close period" is faster than that in most companies, managers viewed the provision of more timely reports as very important. The accounting group at Motorola decided to set itself a target of a 2 working day close.

Motorola now requires its six operating groups and its administrative group "to send monthly numbers no later than 2 working days after month end in a uniform layout that is compatible with the accounting group's software." As numbers are received, accounting performs real-time checks for "unusual transactions, numbers that don't jibe, and other potentially inaccurate entries." The consolidated financial reports are now provided to senior company executives and board members by noon of the third work day after the month end.

Motorola managers, with more timely information about business trends, can now make any adjustments at least 6 working days earlier than before. Moreover, the streamlining undertaken to speed the closing process has resulted in lower costs of monthly closing (a 30% reduction in employees) and a lower errors rate (less than 1,000 errors per 2 million transactions).

What has been the response of the accounting group to this success? They now have a goal of closing in 1½ days! Motorola has a culture of continuous improvement that is applied to all aspects of its business.

Source: B. Ettorre, "How Motorola Closes Its Books in Two Days," *Management Review* (March 1995) plus discussions with Motorola management.



- ◆ A journey with no end.
- ◆ We are running harder just to stand still.
- ◆ If you're not going forward, you're going backward.

Sumitomo Electric Industries, the Japanese manufacturer of electric wires and cables, has daily meetings so that all employees maintain a continuous focus on cost reduction.

We discuss this theme in Chapter 6 (kaizen budgeting), Chapter 7 (continuous improvement standard costs), and Chapter 10 (learning curves).

5. *Dual external/internal focus.* Managers operate in both an external and an internal environment. The external environment includes customers, competitors, suppliers, and government bodies. Many organizations now are restructuring the definition of manager responsibilities to give much greater emphasis to the external environment. This greater emphasis increases the likelihood that managers will anticipate external changes and take advantage of such external changes as the introduction of competitors' new products or shifts in customer preferences. The internal environment covers each part of the value chain as well as the coordination of its components.

We discuss this theme in Chapter 7 when we examine benchmarking and Chapter 25 when we look at market-based transfer pricing.

Over time, the emphasis placed on the five themes in Exhibit 1-7 may change, and new themes may be added. If management accountants are to remain useful to managers, they must keep up to date with changes in the field of management.

PROBLEM FOR SELF-STUDY

(Try to solve this problem before examining the solution that follows.)

PROBLEM

The Campbell Soup Company incurs the following costs:

- a. Purchase of tomatoes by canning plant for Campbell's tomato soup products.
- b. Materials purchased for redesigning Pepperidge Farm biscuit containers to make biscuits stay fresh longer.
- c. Payment to Bates, the advertising agency for the Healthy Request line of soup products.
- d. Salaries of food technologists researching feasibility of a Prego pizza sauce that has zero calories.
- e. Payment to Safeway for shelf space to display Campbell's food products.
- f. Cost of a toll-free telephone line used for customer inquiries about possible taste problems with Campbell's Soups.
- g. Cost of gloves used by line operators on the Swanson Fiesta breakfast food production line.
- h. Cost of hand-held computers used by Pepperidge Farm delivery staff serving major supermarket accounts.

REQUIRED

Classify each cost item (a–h) into a component of the value chain shown in Exhibit 1-1 (p. 4).

SOLUTION

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

SUMMARY

The following points are linked to the chapter's learning objectives.

1. Accounting systems provide information for five broad purposes: (a) formulating overall strategies and long-range plans, (b) resource allocation decisions such as product and customer emphasis, (c) cost planning and cost control, (d) performance measurement, and (e) meeting external regulatory and legal reporting obligations.
2. Cost accounting measures and reports financial and other information related to an organization's acquisition or consumption of resources. It is an important component of both management accounting and financial accounting.
3. Managers in all areas of the value chain are customers of accounting information. The business functions in the value chain are research and development; design of products, services, or processes; production; marketing; distribution; and customer service.
4. Accounting helps facilitate planning, control, and decision making through budgets and other financial benchmarks, its systematic recording of actual results, and its role in performance evaluation.
5. Management accountants and controllers are staff management in most organizations. Staff management exists to provide advice and assistance to line managers, who are directly responsible for attaining the objectives of the organization.

6. In most organizations, management accountants perform scorekeeping, attention-directing, and problem-solving functions. The first function emphasizes the importance of the integrity of information, while the other two emphasize the helper role of the accountant.
7. Management accountants have important ethical responsibilities that are related to competence, confidentiality, integrity, and objectivity.
8. Important management themes that are shaping developments in management accounting systems around the globe include (a) the primacy of customer satisfaction, (b) linking planning and control to key success factors, (c) total value-chain analysis, (d) continuous improvement, and (e) dual external/internal focus.

TERMS TO LEARN

Each chapter will include this section. Like all technical subjects, accounting contains many terms with precise meanings. Pin down the definitions of new terms when you initially encounter them. The meaning of each of the following terms is explained in this chapter and also in the Glossary at the end of this book.

attention directing (p. 9)	Institute of Management Accountants (IMA) (9)
budget (4)	key success factors (14)
Certified Management Accountant (CMA) (9)	line management (7)
chief financial officer (CFO) (7)	management accounting (2)
control (4)	management by exception (5)
controller (7)	marketing (3)
cost accounting (2)	planning (4)
cost-benefit approach (6)	problem solving (9)
cost management (3)	production (3)
customer service (3)	research and development (R&D) (3)
design of products, services, or processes (3)	scorekeeping (8)
distribution (3)	staff management (7)
finance director (7)	value chain (3)
financial accounting (2)	variance (5)

ASSIGNMENT MATERIAL

QUESTIONS

- 1-1 The accounting system should provide information for five broad purposes. Describe them.
- 1-2 Distinguish between *management accounting* and *financial accounting*.
- 1-3 "Management accounting should not fit the straitjacket of financial accounting." Explain and give an example.
- 1-4 Describe the business functions in the value chain.
- 1-5 Explain the meaning of *cost management*.
- 1-6 Feedback may be used for a variety of purposes. Identify at least five uses of feedback.
- 1-7 "Knowledge of technical issues such as computer technology is necessary but not sufficient to becoming a successful accountant." Do you agree? Why?
- 1-8 Peter Drucker, a noted business observer, made the following comment in an address to management accountants: "I am not saying that you do not need a 'cop on the beat,' you do. . . But your great challenge is to get across

to your associates your ability to identify the opportunities—to identify the wealth-producing characteristics.” Do you agree? Explain.

- 1-9 As a new controller, reply to this comment by a plant manager: “As I see it, our accountants may be needed to keep records for stockholders and Uncle Sam—but I don’t want them sticking their noses in my day-to-day operations. I do the best I know how. No pencil-pushing bean-counter knows enough about my responsibilities to be of any use to me.”
- 1-10 As used in accounting, what do IMA and CMA stand for?
- 1-11 Name the four areas in which standards of ethical conduct exist for management accountants in the United States. What organization sets forth these standards?
- 1-12 What steps should a management accountant take if established written policies provide insufficient guidance on how to handle an ethical conflict?
- 1-13 When explaining a motor vehicle market-share turnaround, General Motors stated: “We listened to what our customers wanted and acted on what they said. Good things happen when you pay attention to the boss.” How might management accountants at General Motors apply this same perspective to their own tasks?
- 1-14 A leading management observer stated that the most successful companies are those who have an obsession for their customers. Is this statement pertinent to management accountants? Explain.
- 1-15 Changes in the way managers operate require rethinking the design and operation of management accounting systems. Describe five themes that are affecting both the way managers operate and developments in management accounting.

EXERCISES

- 1-16 **Financial and management accounting.** David Colhane, an able electrical engineer, was informed that he was going to be promoted to assistant plant manager. David was elated but uneasy. In particular, his knowledge of accounting was sparse. He had taken one course in financial accounting but had not been exposed to the management accounting that his superiors found helpful.

Colhane planned to enroll in a management accounting course as soon as possible. Meanwhile, he asked Susan Hansley, an assistant controller, to state two or three of the principal distinctions between financial and management accounting using some concrete examples.

As the assistant controller, prepare a written response to Colhane.

- 1-17 **Purposes of accounting systems.** The International Sports Management Group (ISMG) manages and promotes sporting events and sporting personalities. Its managers are currently examining the following reports and accounting statements:
 - a. Five-year projections for expanding into managing sports television networks for cable television.
 - b. Income statement to be included in a six-month interim report to be sent to investors and filed with the Securities & Exchange Commission.
 - c. Profitability comparison of golf tournaments directed by different managers, each of whom receives a percentage of that tournament’s profits.
 - d. Monthly reports of office costs for each of the 14 ISMG offices worldwide.
 - e. Statement showing the revenues ISMG earns from different types of sporting events (for example, golf, motor racing, and tennis).

REQUIRED

Classify the reports in parts a–e into one of the five major purposes of accounting systems (on p. 2).

- 1-18 **Purposes of accounting systems.** Managers at Coca-Cola are examining the following reports and accounting statements:

- a. Report on the profitability of Minute Maid Orange Juice in different regions; regional managers receive a bonus based on region profitability.
- b. Consolidated balance sheet to be reported in the Annual Report to investors.
- c. Ten-year projections of revenues, costs, and investments for entering into joint venture agreements in the new Russian republics.
- d. Monthly manufacturing cost report of the Toronto bottling plant.
- e. Report comparing profitability of soft drink sales in retail outlets, fast-food franchises, and sporting stadium vendors for most recent month.

REQUIRED

1. Classify the reports in parts a–e into one of the five major purposes of accounting systems (p. 2).
2. How might a report developed for the financial-reporting purpose differ from a report for one of the four management accounting purposes? Illustrate by referring to two of the Coca-Cola reports in parts a–e.

1-19 Value chain and classification of costs, computer company. Apple Computer incurs the following costs:

- a. Electricity costs for the plant assembling the Macintosh computer line of products.
- b. Transportation costs for shipping Macintosh software to a retail chain.
- c. Payment to David Kelley Designs for design of the Powerbook carrying case.
- d. Salary of a computer scientist working on the next generation of mini-computers.
- e. Cost of Apple employees' visit to a major customer to illustrate Apple's ability to interconnect with other computers.
- f. Purchase of competitors' products for testing against potential future Apple products.
- g. Payment to a television station for running Apple advertisements.
- h. Cost of cables purchased from an outside supplier to be used with the Macintosh printer.

REQUIRED

Classify each of the cost items in parts a–h into a component of the value chain shown in Exhibit 1-1 (p. 4).

1-20 Value chain and classification of costs, pharmaceutical company. Merck, a large pharmaceutical company, incurs the following costs:

- a. Cost of redesigning blister packs to make drug containers more tamper-proof.
- b. Cost of videos sent to doctors to promote sales of a new drug.
- c. Cost of a toll-free telephone line used for customer inquiries about usage, side effects of drugs, and so on.
- d. Equipment purchased by a scientist to conduct experiments on drugs yet to be approved by the government.
- e. Payment to actors on infomercial to be shown on television promoting new hair-growing product for balding men.
- f. Labor costs of workers in the packaging area of a production facility.
- g. Bonus paid to a salesperson for exceeding monthly sales quota.
- h. Cost of Federal Express courier service to deliver drugs to hospitals.

REQUIRED

Classify each of the cost items in parts a–h into a component of the value chain shown in Exhibit 1-1 (p. 4).

1-21 Uses of feedback. Six uses of feedback are described in the chapter (p. 6):

- a. Changing goals.
- b. Searching for alternative means of operating.
- c. Changing methods for making decisions.
- d. Making predictions.
- e. Changing the operating process.
- f. Changing the reward system.

REQUIRED

Match the appropriate letters from the preceding list to each of the following items.

1. The California State University system explores subcontracting its gardening operations to a private company instead of hiring its own gardeners.
2. Sales commissions are to be based on total operating income instead of total revenue.
3. The Ford Motor Company adjusts its elaborate way of forecasting demand for its cars by including the effects of expected changes in the price of crude oil.
4. The hiring of new sales personnel will include an additional step: an interview and evaluation by the company psychologist.
5. Quality inspectors at General Motors are now being used in the middle of the production process as well as at the end of the process.
6. Procter & Gamble enters the telecommunications industry.
7. Worker assignments on an assembly line are made by teams instead of directed by a foreman.

1-22 Scorekeeping, attention directing, and problem solving. For each of the following activities, identify the major function (scorekeeping, attention directing, or problem solving) the accountant is performing.

- a. Preparing a monthly statement of Australian sales for the IBM marketing vice president.
- b. Interpreting differences between actual results and budgeted amounts on a performance report for the customer warranty department of General Electric.
- c. Preparing a schedule of depreciation for forklift trucks in the receiving department of a Hewlett Packard plant in Scotland.
- d. Analyzing, for a Mitsubishi international manufacturing manager, the desirability of buying some auto parts made in Korea.
- e. Interpreting why a Birmingham distribution center did not adhere to its delivery costs budget.
- f. Explaining a Xerox shipping department's performance report.
- g. Preparing, for the manager of production control of a U.S. steel plant, a cost comparison of two computerized manufacturing control systems.
- h. Preparing a scrap report for the finishing department of a Toyota parts plant.
- i. Preparing the budget for the maintenance department of Mount Sinai Hospital.
- j. Analyzing, for a General Motors product designer, the impact on product costs of some new headlight lamps.

1-23 Scorekeeping, attention directing, and problem solving. For each of the following activities, identify the major function the accountant is performing—scorekeeping, attention directing, or problem solving.

- a. Interpreting differences between actual results and budgeted amounts on a shipping manager's performance report at a Daewoo distribution center.
- b. Preparing a report showing the benefits of leasing motor vehicles versus owning them.
- c. Preparing adjusting journal entries for depreciation on the personnel manager's office equipment at Citibank.
- d. Preparing a customer's monthly statement for a Sears store.
- e. Processing the weekly payroll for the Harvard University maintenance department.
- f. Explaining the product-design manager's performance report at a Chrysler division.
- g. Analyzing the costs of several different ways to blend materials in the foundry of a General Electric plant.
- h. Tallying sales, by branches, for the sales vice president of Unilever.

- i. Analyzing, for the president of Microsoft, the impact of a contemplated new product on net income.
- j. Interpreting why an IBM sales district did not meet its sales quota.

1-24 Changes in management and changes in management accounting. A survey on ways organizations are changing their management accounting systems reported the following:

- a. Company A now reports a value-chain income statement for each of the brands it sells.
- b. Company B now presents in a single report all costs related to achieving high quality levels of its products.
- c. Company C now presents estimates of the manufacturing costs of its two most important competitors in its performance reports, in addition to its own internal manufacturing costs.
- d. Company D reduces by 1% each month the budgeted labor-assembly cost of a product when evaluating the performance of a plant manager.
- e. Company E now reports profitability and satisfaction measures (as assessed by a third party) on a customer-by-customer basis.

REQUIRED

Link each of the above changes to one of the key themes in the new management approach outlined in Exhibit 1-7 (p. 13).

PROBLEMS

1-25 Planning and control, feedback. In April 19₇, Naomi Campbell, editor of *The Daily Sporting News* (DSN), decides to reduce the price per newspaper from \$0.70 in April 19₇ to \$0.50 starting May 1, 19₇. Actual paid circulation in April is 7.5 million (250,000 per day $\times$ 30 days). Campbell estimates that the \$0.20 price reduction would increase paid circulation in May to 12.4 million (400,000 $\times$ 31 days). The actual May circulation turns out to be 13,640,000 (440,000 $\times$ 31 days). Assume that one goal of DSN is to increase operating income. The budgeted increase in circulation would enable DSN to charge higher advertising rates in later months of 19₇ if those budgeted gains actually occur. The actual price paid in May 19₇ was the budgeted \$0.50 per newspaper.

REQUIRED

1. Distinguish between planning and control at DSN, giving an example of each.
2. Prepare a newspaper revenue performance report for DSN for May 19₇ showing the actual results, budgeted amounts, and the variance.
3. Give two types of action Campbell might take based on feedback on the May 19₇ circulation revenue.

1-26 Responsibility for analysis of performance. Karen Phillipson is the new corporate controller of a multinational company that has just overhauled its organizational structure. The company is now decentralized. Each division is under an operating vice president who, within wide limits, has responsibilities and authority to run the division like a separate company.

Phillipson has a number of bright staff members. One of them, Bob Garrett, is in charge of a newly created performance-analysis staff. Garrett and staff members prepare monthly division performance reports for the company president. These reports are division income statements, showing budgeted performance and actual results, and they are accompanied by detailed written explanations and appraisals of variances. In the past, each of Garrett's staff members was responsible for analyzing one division; each consulted with division line and staff executives and became generally acquainted with the division's operations.

After a few months, Bill Whisler, vice president in charge of Division C, stormed into the controller's office. The gist of his complaint follows:

"Your staff is trying to take over part of my responsibility. They come in, snoop around, ask hundreds of questions, and take up plenty of our time.

It's up to me, not you and your detectives, to analyze and explain my division's performance to central headquarters. If you don't stop trying to grab my responsibility, I'll raise the whole issue with the president."

REQUIRED

1. What events or relationships may have led to Whisler's outburst?
2. As Phillipson, how would you answer Whisler's contentions?
3. What alternative actions can Phillipson take to improve future relationships?

- 1-27 Professional ethics and reporting divisional performance.** Marcia Miller is division controller and Tom Maloney is division manager of the Ramses Shoe Company. Miller has line responsibility to Maloney, but she also has staff responsibility to the company controller.

Maloney is under severe pressures to achieve budgeted division income for the year. He has asked Miller to book \$200,000 of sales on December 31. The customers' orders are firm, but the shoes are still in the production process. They will be shipped on or about January 4. Maloney said to Miller, "The key event is getting the sales order, not shipping of the shoes. You should support me, not obstruct my reaching division goals."

REQUIRED

1. Describe Miller's ethical responsibilities.
2. What should Miller do if Maloney gives her a direct order to book the sales?

- 1-28 Software procurement decision, ethics.** Jorge Michaels is the Chicago-based controller of Fiesta Foods, a rapidly growing manufacturer and marketer of Mexican food products. Michaels is currently considering the purchase of a new cost management package for use by each of its six manufacturing plants and its many marketing personnel. There are four major competing products being considered by Michaels.

Horizon 1-2-3 is an aggressive software developer. It views Fiesta as a target of opportunity. Every 6 months Horizon has a 3-day user's conference in a Caribbean location. Each conference has substantial time left aside for "rest and recreation." Horizon offers Michaels an all-expenses-paid visit to the upcoming conference in Cancun, Mexico. Michaels accepts the offer believing that it will be very useful to talk to other users of Horizon software. He is especially looking forward to the visit as he has close relatives in the Cancun area.

Prior to leaving, Michaels received a visit from the president of Fiesta. She shows him an anonymous letter sent to her. It argues that Horizon is receiving unfair favorable treatment in the Fiesta software decision-making process. The letter specifically mentions Michaels' upcoming "all-expenses-paid trip to Cancun during Chicago's deep winter." Michaels is deeply offended. He says he has made no decision and believes he is very capable of making a software choice on the merits of each product. Fiesta currently does not have a formal written code of ethics.

REQUIRED

1. Do you think Michaels faces an ethical problem as regards his forthcoming visit to the Horizon's user's group meeting? Refer to Exhibit 1-5 (p. 10). Explain.
2. Should Fiesta allow executives to attend user's meetings while negotiating with other vendors about a purchase decision? Explain. If yes, what conditions on attending should apply?
3. Would you recommend Fiesta develop its own code of ethics to handle situations such as this one? What are the pros and cons of having such a written code?

- 1-29 Professional ethics and end-of-year games.** Janet Taylor is the new division controller of the snack foods division of National Foods. National Foods has reported a minimum 15% growth in annual earnings for each of

the past five years. The snack foods division has reported annual earnings growth of over 20% each year in this same period. During the current year, the economy went into a recession. The corporate controller estimates a 10% annual earnings growth rate for National Foods in this year. One month before the December 31, fiscal year end of the current year, Taylor estimates the snack foods division will report an annual earnings growth of only 8%. Warren Ryan, the snack foods division president, is less than happy, but he says with a wry smile, "Let the end-of-year games begin."

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

- a. Deferring routine monthly maintenance in December on packaging equipment by an independent contractor until January of next year.
- b. Extending the close of the current fiscal year beyond December 31 so that some sales of next year are included in the current year.
- c. Altering dates of shipping documents of next January's sales to record them as sales in December of the current year.
- d. Giving salespeople a double bonus to exceed December sales targets.
- e. Deferring the current period's advertising by reducing the number of television spots run in December and running more than planned in January of next year.
- f. Deferring the current period's reported advertising costs by having National Food's outside advertising agency delay billing December advertisements until January of next year or having the agency alter invoices to conceal the December date.
- g. Persuading carriers to accept merchandise for shipment in December of the current year although they normally would not have done so.

REQUIRED

1. Why might the snack foods division president want to play the end-of-year games described here?
2. The division controller is deeply troubled and reads the *Standards of Ethical Conduct for Management Accountants* in Exhibit 1-5 (p. 10). Classify each of the end-of-year games as (i) acceptable or (ii) unacceptable according to that document.
3. What should Taylor do if Ryan suggests that end-of-year games are played in every division of National Foods and that she would greatly harm the snack foods division if she did not play along and paint the rosiest picture possible of the division's results?

COLLABORATIVE LEARNING PROBLEM

- 1-30 Responding to allegations of fraud.** You are the controller of Broad Street Finance (BSF). BSF is an investment banking company that has recently encountered severe financial difficulties and has had to lay off over 200 employees. The only bright spot in this picture is BSF's bond-trading division, but you have just received the following anonymous letter:

Dear Sir,

Last year's reported earnings for the bond-trading division are fictitious. The top three managers of the division recently received bonuses of over \$12 million, based on their share of last year's reported earnings. The head of bond trading has been inventing bond trades that are supposed to be highly profitable. They are not. The division profits are like a deck of cards about to collapse. The head of bond trading cares only about "how much you reportedly made" and nothing about how you made it. The auditors don't understand the complexity of today's bond-trading operations. This problem will blow up in your face unless handled quickly and carefully. I am sending a copy of this letter to the Securities & Exchange

Commission, *Business Week*, *Forbes*, *Fortune*, and all members of Broad Street's board of directors.

Sincerely,
Concerned Exemployee

INSTRUCTIONS

Form groups of three or more students. One is to be the chief financial officer, one the president, and one the chairman of the board of directors. Other members are on the board of directors.

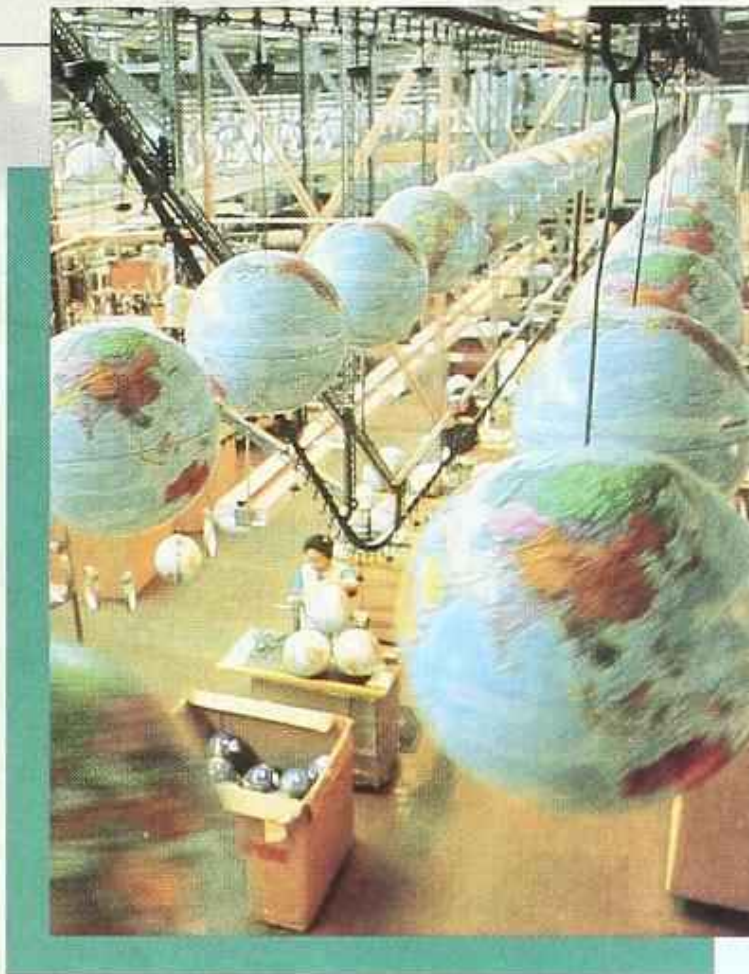
REQUIRED

Develop a group consensus on how you should respond to this letter. Should BSF formalize a code of ethics statement? Like many firms in the financial services industry, it has no formal code of ethics.

2

CHAPTER

AN INTRODUCTION TO COST TERMS AND PURPOSES



Many costing systems have multiple cost objects. Managers at a factory can collect costs for their mass-produced products (such as globes), for the assembly plant, and for customers who have globes custom assembled at the plant.

LEARNING OBJECTIVES

After studying this chapter, you should be able to

1. Define and illustrate a cost object
2. Distinguish between direct costs and indirect costs
3. Explain cost drivers, variable costs, and fixed costs
4. Understand why unit costs must be interpreted with caution
5. Distinguish among service-sector, merchandising-sector, and manufacturing-sector companies
6. Differentiate between capitalized costs and noncapitalized costs
7. Describe the three categories of inventories commonly found in many manufacturing-sector companies
8. Explain how different ways of computing product costs are appropriate for different purposes

This chapter explains several widely recognized cost concepts and terms. They will help us demonstrate the multiple purposes of cost accounting systems, which we will stress throughout the book.

Various cost concepts and terms are useful in many contexts, including decision making in all areas of the value chain. They help managers decide such issues as, How much should we spend for research and development? What is the effect of product design changes on manufacturing costs? Should we replace some production assembly workers with a robot? Should we spend more of the marketing budget on sales promotion coupons and less on advertising? Should we distribute from a central warehouse or from regional warehouses? Should we provide a toll-free number for customer inquiries regarding our products?

COSTS IN GENERAL

OBJECTIVE 1

Define and illustrate a cost object

Cost Objects

Accountants usually define **cost** as a resource sacrificed or forgone to achieve a specific objective. Most people consider costs as monetary amounts (such as dollars, pesos, pounds, or yen) that must be paid to acquire goods and services. For now we can think of costs in this conventional way.

To guide their decisions, managers often want to know how much a certain thing (such as a new product, a machine, a service, or a process) costs. We call this “thing” a **cost object**, which is anything for which a separate measurement of costs is desired. Exhibit 2-1 provides examples of several different types of cost objects.

Cost Accumulation and Cost Assignment

A costing system typically accounts for costs in two basic stages:

Stage 1 It *accumulates* costs by some “natural” (often self-descriptive) classification such as materials, labor, fuel, advertising, or shipping.

Stage 2 It *assigns* these costs to cost objects.

Cost accumulation is the collection of cost data in some organized way through an accounting system. **Cost assignment** is a general term that encompasses both (1) tracing accumulated costs to a cost object, and (2) allocating accumulated costs to a cost object. Costs that are traced to a cost object are direct costs, and costs that are allocated to a cost object are indirect costs. Nearly all accounting systems accumulate **actual costs**, which are the costs incurred (historical costs), as distinguished from budgeted or forecasted costs.

EXHIBIT 2-1
Examples of Cost Objects

Cost Object	Illustration
◆ Product	A ten-speed bicycle
◆ Service	An airline flight from Los Angeles to London
◆ Project	An airplane assembled by Boeing for Singapore Airlines
◆ Customer	All products purchased by Safeway (the customer) from General Foods
◆ Brand category	All soft drinks sold by a Pepsi-Cola bottling company with “Pepsi” in their name
◆ Activity	A test to determine the quality level of a television set
◆ Department	A department within a government environmental agency that studies air emissions standards
◆ Program	An athletic program of a university

In some organizations, stage 1 (cost accumulation) and stage 2 (cost assignment) occur simultaneously. Consider the purchase by Boeing of 100 business-class seats to be installed in a 767 airplane to be sold to British Airways. This transaction could be coded to a general ledger account such as materials (the cost accumulation stage) and simultaneously coded to three separate cost objects (the cost assignment stage):

- ◆ a department (assembly)
- ◆ a product (767 product line)
- ◆ a customer (British Airways)

Alternatively, stage 1 (cost accumulation) could occur first, followed by stage 2 (cost assignment). For example, the 100-seat purchase by Boeing could first be coded to the materials account, then subsequently assigned to a department, then reassigned to a product, and finally reassigned to a customer. Advances in information-gathering technology (such as bar coding) are facilitating the simultaneous assignment of costs to more than one cost object at the time costs are incurred.

Remember, managers assign costs to designated cost objects to help decision making. For example, costs may be assigned to a department to facilitate decisions about departmental efficiency. Costs may also be assigned to a product or a customer to facilitate product or customer profitability analysis.

DIRECT COSTS AND INDIRECT COSTS

Cost Tracing and Cost Allocation

A major question concerning costs is whether they have a direct or an indirect relationship to a particular cost object.

- ◆ **Direct costs of a cost object** are costs that are related to the particular cost object and that can be traced to it in an economically feasible (cost-effective) way.
- ◆ **Indirect costs of a cost object** are costs that are related to the particular cost object but cannot be traced to it in an economically feasible (cost-effective) way. Indirect costs are allocated to the cost object using a cost allocation method.

Take a baseball bat as a cost object. The cost of the piece of wood used to make that bat is a direct cost. Why? Because the amount of wood used in making the bat can easily be traced to the bat. The cost of lighting in the factory where the bat was made is an indirect cost of the bat. Why? Because although lighting helped in the making of the bat (the workers needed to see), it is not cost effective to try to determine exactly how much lighting cost was used for a specific bat.

Managers prefer to make decisions on the basis of direct costs rather than indirect costs. Why? Because they know that direct costs are more accurate than indirect costs. In summary, the relationship between these terms is



Cost tracing is the assigning of direct costs to the chosen cost object. **Cost allocation** is the assigning of indirect costs to the chosen cost object. *Cost assignment* encompasses both cost tracing and cost allocation.

OBJECTIVE 2

Distinguish between direct costs and indirect costs

Factors Affecting Direct/Indirect Cost Classifications

Several factors will affect the classification of a cost as direct or indirect:

1. *The materiality of the cost in question.* The higher the cost in question, the more likely the economic feasibility of tracing that cost to a particular cost object. Consider a mail-order catalog company. It would probably be economically feasible to trace the courier charges for delivering a package directly to each customer. In contrast, the cost of the invoice paper included in the package sent to the customer is likely to be classified as an indirect cost because it is not economically feasible to trace the cost of this paper to each customer. The benefits of knowing the exact number of (say) \$0.05 worth of paper included in each package typically do not justify the costs of money and time in tracing the costs to each package.
2. *Available information-gathering technology.* Improvements in this area are enabling an increasing percentage of costs to be classified as direct. Bar codes, for example, allow many manufacturing plants to treat certain materials previously classified as indirect costs as direct costs of products. Bar codes can be read into a manufacturing cost file by waving a "wand" in the same quick and efficient way supermarkets now enter the cost of many items purchased by its customers.
3. *Design of operations.* Facility design can impact cost classification. For example, classifying a cost as direct is helped if an organization's facility (or part thereof) is used exclusively for a specific product or specific cost object, such as a particular customer.
4. *Contractual arrangements.* For example, a contract stating that a given component (an Intel Pentium chip) can be used only in a specific product (an IBM PC) makes it easier to classify the component as a direct cost of the product.

This book examines different ways to assign costs to cost objects. For now, be aware that one particular cost may be both direct and indirect. How? *The direct/indirect classification depends on the choice of the cost object.* For example, the salary of an assembly-department supervisor may be a direct cost of the assembly department at Ford but an indirect cost of a product such as the Ford Taurus.

COST DRIVERS AND COST MANAGEMENT

OBJECTIVE 3

Explain cost drivers, variable costs, and fixed costs

The continuous cost reduction efforts of competitors create a never-ending need for organizations to reduce their own costs. Cost reduction efforts frequently focus on two key areas:

1. Doing only **value-added activities**, that is, those activities that customers perceive as adding value to the products or services they purchase.
2. Efficiently managing the use of the cost drivers in those value-added activities.

A **cost driver** (also called a *cost generator* or *cost determinant*) is any factor that affects total costs. That is, a change in the level of the cost driver will cause a change in the level of the total cost of a related cost object.

Exhibit 2-2 presents examples of cost drivers in each of the business functions of the value chain. Some cost drivers are financial measures found in accounting systems (such as direct manufacturing labor costs and sales dollars), while others are nonfinancial variables (such as the number of parts per product and the number of service calls). We now discuss the role of cost drivers in describing cost behavior.

Cost management is the set of actions that managers take to satisfy customers while continuously reducing and controlling costs. A caveat on the role of cost drivers in cost management is appropriate. Changes in a particular cost driver do not automatically lead to changes in overall costs. Consider the number of items distributed as a driver of distribution labor costs. Suppose that management reduces the number of items distributed by 25%. This reduction does not automatically translate to a reduction in distribution labor costs. Managers must take steps to reduce distribution labor costs, perhaps by shifting workers out of distribution into other business functions needing additional labor or by laying off some distribution employees.

EXHIBIT 2-2

Examples of Cost Drivers of Business Functions in the Value Chain

Business Function	Cost Driver
Research and development	◆ Number of research projects ◆ Personnel hours on a project ◆ Technical complexity of projects
Design of products, services, and processes	◆ Number of products in design ◆ Number of parts per product ◆ Number of engineering hours
Production	◆ Number of units produced ◆ Direct manufacturing labor costs ◆ Number of setups ◆ Number of engineering change orders
Marketing	◆ Number of advertisements run ◆ Number of sales personnel ◆ Sales dollars
Distribution	◆ Number of items distributed ◆ Number of customers ◆ Weight of items distributed
Customer service	◆ Number of service calls ◆ Number of products serviced ◆ Hours spent servicing products

COST BEHAVIOR PATTERNS: VARIABLE COSTS AND FIXED COSTS

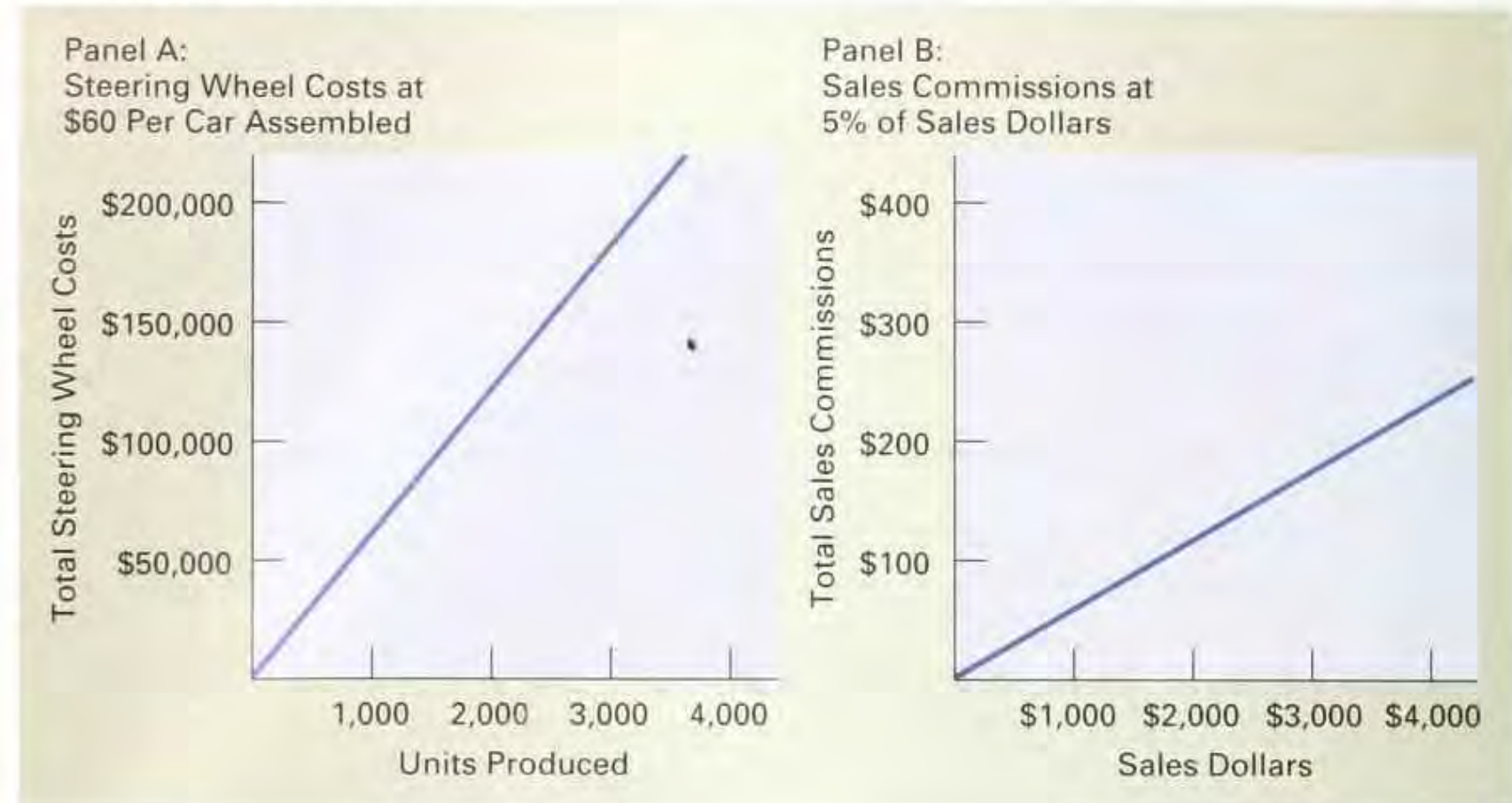
Management accounting systems record the cost of resources acquired and track their subsequent use. Tracing these costs allows managers to see how these costs behave. Let us now consider two basic types of cost behavior patterns found in many of these systems—variable costs and fixed costs. A **variable cost** is a cost that changes in total in proportion to changes in a cost driver. A **fixed cost** is a cost that does not change in total despite changes in a cost driver.

- ◆ **Variable Costs.** If General Motors buys a steering wheel at \$60 for each of its Saturn cars, then the total cost of steering wheels should be \$60 times the number of cars assembled. This is an example of a variable cost, a cost that changes *in total* in proportion to changes in the cost driver (number of cars). The variable cost per car does not change with the number of cars assembled. Exhibit 2-3 (Panel A) illustrates this variable cost. A second example of a variable cost is a sales commission of 5% of each sales dollar. Exhibit 2-3 (Panel B) shows this variable-cost example.
- ◆ **Fixed Costs.** General Motors may incur \$20 million in a given year for the leasing and insurance of its Saturn plant. Both are examples of fixed costs, costs that are unchanged in total over a designated range of the cost driver during a given time span. Fixed costs become progressively smaller on a per unit basis as the cost driver increases. For example, if General Motors assembles 10,000 Saturn vehicles at this plant in a year, the fixed cost for leasing and insurance per vehicle is \$2,000 (\$20 million ÷ 10,000). In contrast, if 50,000 vehicles are assembled, the fixed cost per vehicle becomes \$400.

Do not assume that individual cost items are inherently variable or fixed. Consider labor costs. An example of purely variable labor costs is the case where workers are paid on a piece-unit basis. Some textile workers are paid on a per shirt sewed basis. In contrast, labor costs are appropriately classified as fixed

EXHIBIT 2-3

Examples of Variable Costs



when life-time employment exists or where union conditions severely restrict an organization's flexibility to assign workers to any area that has extra labor requirements.

Major Assumptions

The definitions of variable costs and fixed costs have important underlying assumptions:

1. Costs are defined as variable or fixed with respect to a specific cost object.
2. The time span must be specified. Consider the \$20 million rent and insurance General Motors pays for its Saturn plant. This amount may be fixed for one year. Beyond that time, the rent and insurance may be renegotiated to be, say, \$22 million for a subsequent year.
3. Total costs are linear. That is, when plotted on ordinary graph paper, a total variable-cost or a total fixed-cost relationship to the cost driver will appear as an unbroken straight line.
4. There is only one cost driver. The influences of other possible cost drivers on total costs are held constant or deemed to be insignificant.
5. Variations in the level of the cost driver are within a relevant range (which we discuss in the next section).

Variable costs and fixed costs are the two most frequently recognized cost behavior patterns in existing management accounting systems. Additional cost behavior patterns are discussed in subsequent chapters (see Chapters 5 and 10).

Relevant Range

A **relevant range** is the range of the cost driver in which a specific relationship between cost and driver is valid. A fixed cost is fixed only in relation to a given relevant range (usually wide) of the cost driver and a given time span (usually a particular budget period). Consider the Thomas Transport Company (TTC), which operates two refrigerated trucks that carry agricultural produce to market. Each truck has an annual fixed cost of \$40,000 (including an annual insurance cost of \$15,000 and an annual registration fee of \$8,000) and a variable cost of \$1.20 per mile of hauling. TTC has chosen miles of hauling to be the cost driver. The maximum annual usage of each truck is 120,000 miles. In the

Purposes for Distinguishing Between Variable Costs and Fixed Costs

Many chapters in this book illustrate the insights gained from distinguishing between variable costs and fixed costs. One survey* of U.S. companies reported the following ranking of purposes for distinguishing between variable and fixed costs (1 = most important purpose). The relevant chapters refer to where each purpose is extensively discussed in this book.

Rank	Purpose	Relevant Chapters
1 (equal)	Pricing	4, 5, 11, and 12
1 (equal)	Budgeting	6
3	Profitability analysis—existing products	4, 5, 11, and 12
4	Profitability analysis—new products	11 and 12
5	Cost-volume-profit (CVP) analysis	3
6	Variance analysis	7, 8, 16, and 24

Surveys of Australian, Japanese, and United Kingdom companies provide additional evidence on the ranking by managers of the many purposes for distinguishing between variable costs and fixed costs (1 = most important purpose):[†]

Purpose	Ranking by Companies in Australia	Ranking by Companies in Japan	Ranking by Companies in United Kingdom
Pricing decisions	1	5	1
Budgeting ²	2	3	
Making profit plans	3	1	2
Cost reduction	6	3	5 (equal)
CVP analysis	4 (equal)	4	4
Cost-benefit analysis	4 (equal)	6	5 (equal)

These surveys highlight the wide range of decisions for which managers feel an understanding of cost behavior is important.

*Adapted from Mowen, *Accounting for Costs*.

[†]Blayney and Yokoyama, "Comparative Analysis." Full citations are in Appendix A at the back of the book.

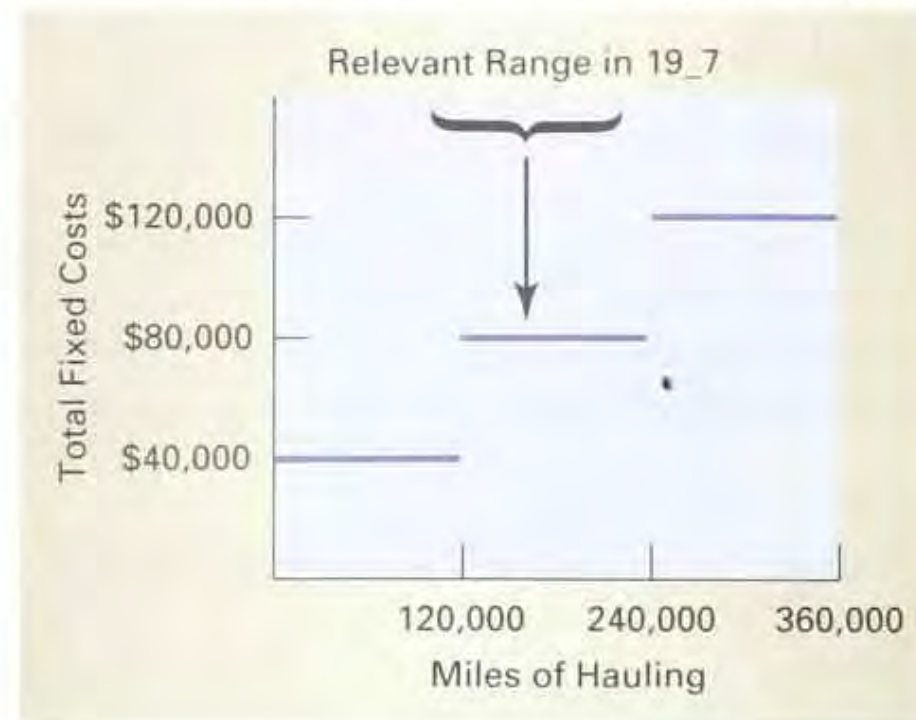
current year (19_7), the predicted combined total hauling of the two trucks is 170,000 miles.

Exhibit 2-4 shows how annual fixed costs behave at different levels of miles of hauling. Up to 120,000 miles, TTC can operate with one truck; from 120,001 to 240,000 miles, it can operate with two trucks; and from 240,001 to 360,000, it can operate with three trucks. This pattern would continue as TTC added trucks to its fleet. The bracketed section from 120,001 to 240,000 is the range at which TTC expects the \$80,000 to be valid given the predicted 170,000-mile usage for 19_7.

Fixed costs may change from one year to the next. For example, if the annual registration fee for refrigerated trucks is increased in 19_8, the total level of fixed costs will increase (unless offset by a reduction in other fixed items).¹

¹Cost behavior questions appear in professional examinations with regularity. For example, see the supplement to this text book: J. K. Harris and D. W. Curry, *Student Guide and Review Manual* (Upper Saddle River, N.J.: Prentice Hall, 1997).

EXHIBIT 2-4
Fixed-Cost Behavior at Thomas Transport Company



Relationships of Types of Costs

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

- ◆ direct and variable
- ◆ direct and fixed
- ◆ indirect and variable
- ◆ indirect and fixed

Exhibit 2-5 presents examples of simultaneous cost classifications with each of the four cost types.

EXHIBIT 2-5
Examples of Simultaneous Direct/Indirect and Variable/Fixed Cost Classifications

		Assignment of Costs to Cost Object	
		Direct Cost	Indirect Cost
Cost Behavior Pattern	Variable Cost	Cost object: Assembled automobile Example: Tires used in assembly of automobile	Cost object: Assembled automobile Example: Power costs where power usage is metered only to the plant
	Fixed Cost	Cost object: Marketing department Example: Annual leasing cost of cars used by sales force representatives	Cost object: Marketing department Example: Monthly charge by corporate computer center for marketing's share of corporate computer costs

TOTAL COSTS AND UNIT COSTS

OBJECTIVE 4

Understand why unit costs must be interpreted with caution

Meaning of Unit Costs

Accounting systems typically report both total-cost and unit-cost numbers. A **unit cost** (also called an **average cost**) is computed by dividing some total cost by some number of units. Suppose that \$980,000 of manufacturing costs were incurred to produce 10,000 units of a finished good. Then the unit cost would be \$98:

$$\frac{\text{Total manufacturing costs}}{\text{Number of units manufactured}} = \frac{\$980,000}{10,000} = \$98 \text{ per unit}$$

If 8,000 units are sold and 2,000 units remain in ending inventory, the unit-cost concept helps in the assignment of total costs for the income statement and balance sheet:

Cost of goods sold in the income statement, 8,000 units $\times$ \$98	\$784,000
Ending inventory of finished goods in the balance sheet, 2,000 units $\times$ \$98	196,000
Total manufacturing costs of 10,000 units	<u>\$980,000</u>

Unit costs are found in all areas of the value chain—for example, there are unit costs for product design, sales calls, and customer-service calls.

Use Unit Costs Cautiously

Unit costs are averages. As we shall see, they must be interpreted with caution. For decision making, it is best to think in terms of total costs rather than unit costs. Nevertheless, unit-cost numbers are frequently used in many situations. For example, assume the president of a university social club is deciding whether to hire a musical group for an upcoming party. The group charges a fixed fee of \$1,000. The president may intuitively compute a unit cost for the group when thinking about an admission price. Given the fixed fee of \$1,000, the unit cost is \$10 if 100 people attend, \$2 if 500 attend, and \$1 if 1,000 attend. Note, however, that with a fixed fee of \$1,000 the *total cost* is unaffected by the attendance level, while the *unit cost* is a function of the attendance level. In this example, each attendee is considered to be one unit.

Costs are often neither inherently fixed nor variable. Much depends on the specific context. Consider the \$1,000 fixed fee that we assumed was to be paid to the musical group. This is but one way the musical group could be paid. Possible payment schedules that might be considered include

- ◆ Schedule 1: \$1,000 fixed fee
- ◆ Schedule 2: \$1 per person attending + \$500 fixed fee
- ◆ Schedule 3: \$2 per person attending

Under schedules 2 and 3, the dollar amount of the payment to the musical group is not known until after the event.

The effects of these three payment schedules on unit costs and total costs for five attendance levels are

Number of Persons Attending	Schedule 1: \$1,000 Fixed		Schedule 2: \$1 Per Person + \$500 Fixed		Schedule 3: \$2 Per Person	
	Total Cost	Unit Cost	Total Cost	Unit Cost	Total Cost	Unit Cost
50	\$1,000	\$20	\$ 550	\$11	\$ 100	\$2
100	1,000	10	600	6	200	2
250	1,000	4	750	3	500	2
500	1,000	2	1,000	2	1,000	2
1,000	1,000	1	1,500	1.50	2,000	2

The unit cost under schedule 1 is computed by dividing the fixed cost of \$1,000 by the attendance level. For schedule 2, the unit cost is computed by first determining the total cost for each attendance level and then dividing that amount by that attendance level. Thus, for 250 people, schedule 2 has a total cost of \$750 (\$500 + 250 $\times$ \$1), which gives a unit cost of \$3 per person. Schedule 3 has a unit cost of \$2 per person for any attendance level because the musical group is to be paid \$2 per person with no fixed payment.

All three payment schedules would yield the same unit cost of \$2 per person only if 500 people attend. The unit cost is not \$2 per person under schedule 1 or schedule 2 for any attendance level except 500 people. Thus, it would be incorrect to use the \$2 per person amount in schedule 1 or 2 to predict what the total costs would be for 1,000 people. Consider what occurs if 250 people attend and the group is paid a fixed fee of \$1,000. The unit cost is then \$4 per person. *While unit costs are often useful, they must be interpreted with extreme caution if they include fixed costs per unit.* When estimating total cost, think of variable costs as an amount per unit and fixed costs as a lump sum total amount.

The key relationships between total costs and unit costs are summarized in Panel A of Exhibit 2-6. Panel B illustrates these relationships for schedule 3 where the university social club pays the musical group on a variable basis (cost of \$2 per person). Panel C illustrates schedule 1 where the musical group is paid a fixed amount (cost of \$1,000).

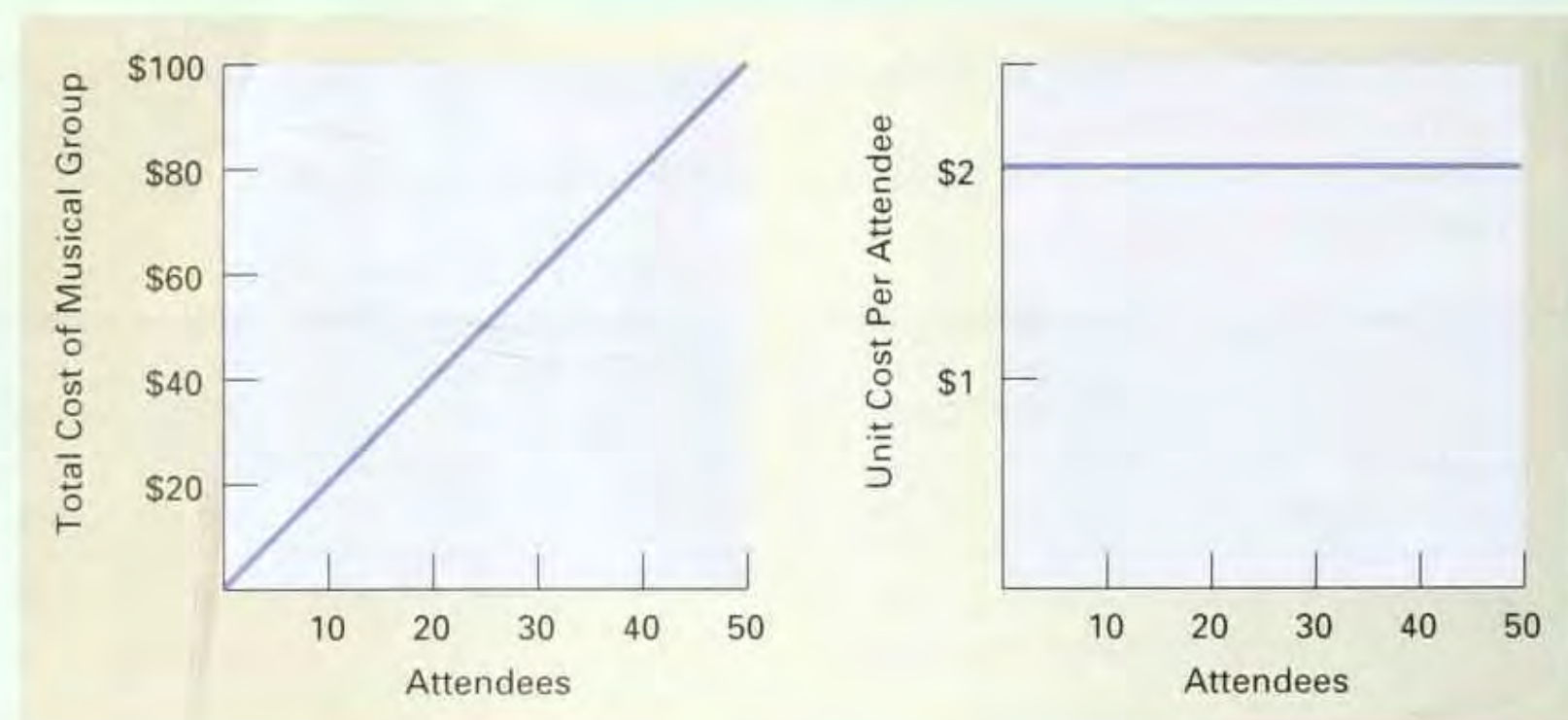
EXHIBIT 2-6

Behavior of Total Costs and Unit Costs when the Level of the Cost Driver Changes with Illustration of Alternate Payment Schedules for Musical Group

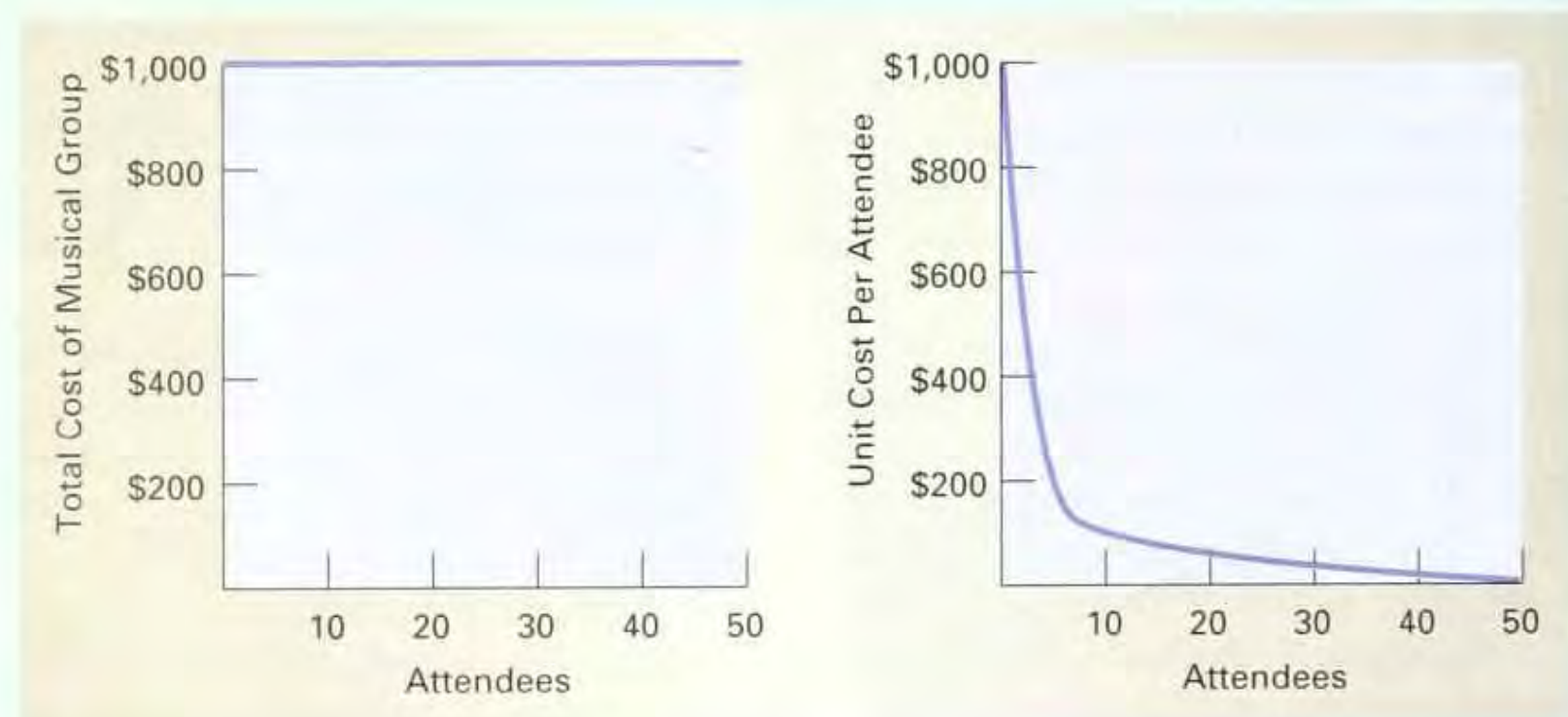
PANEL A: SUMMARY OF KEY RELATIONSHIPS

Cost Behavior Pattern	Total Costs	Unit Costs
When item is a variable cost	Total costs change with changes in level of cost driver	Units costs remain the same with changes in level of cost driver
When item is a fixed cost	Total costs remain the same with changes in level of cost driver	Unit costs change with changes in level of cost driver

PANEL B: PAYMENT IS \$2 PER ATTENDEE



PANEL C: PAYMENT IS A FIXED \$1,000



FINANCIAL STATEMENTS AND COST TERMINOLOGY

We now consider costs included in the income statements or balance sheets of service-, merchandising-, and manufacturing-sector companies. One key distinction of costs is their classification as capitalized or noncapitalized when they are incurred:

- ◆ **Capitalized costs** are first recorded as an asset (capitalized) when they are incurred. These costs are presumed to provide future benefits to the company. Examples are costs to acquire computer equipment and motor vehicles. These costs are written off to those periods assumed to benefit from their incurrence. For example, the cost of acquiring motor vehicles is written off as a depreciation expense that occurs each year of the expected useful life of the vehicle.
- ◆ **Noncapitalized costs** are recorded as expenses of the accounting period when they are incurred. Examples are salaries paid to marketing personnel and monthly rent paid for administrative offices.

These two categories of costs apply to companies in all three sectors of the economy.

SERVICE-SECTOR COMPANIES

Service-sector companies provide services or intangible products to their customers—for example, legal advice or an audit. These companies do not have any inventory of tangible product at the end of an accounting period. Examples include law firms, accounting firms, advertising agencies, and television stations. Labor costs are typically the most significant cost category, often being as high as 70% of total costs.

Exhibit 2-7 (Panel A) presents an income statement for Elliott & Partners, a law firm specializing in personal-injury litigation. The customers (clients) of this law

OBJECTIVE 5

Distinguish among service-sector, merchandising-sector, and manufacturing-sector companies

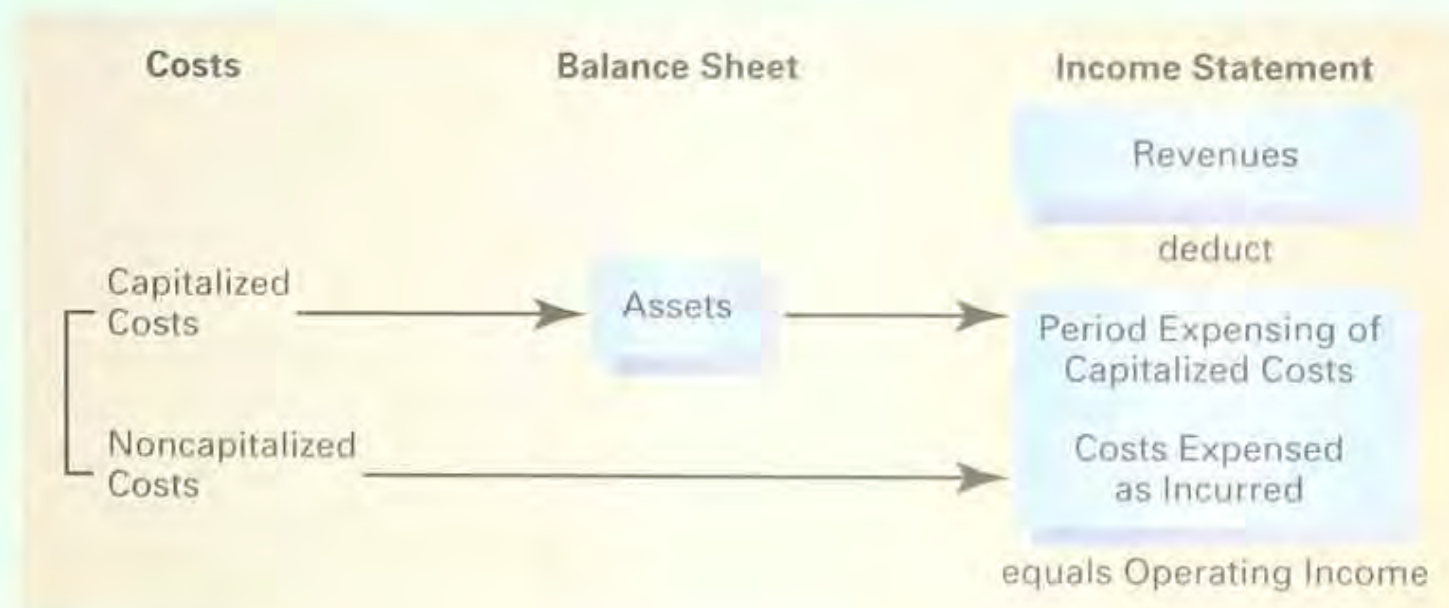
EXHIBIT 2-7

Service-Sector Income Statement

PANEL A: ELLIOTT & PARTNERS INCOME STATEMENT FOR THE YEAR ENDED DECEMBER 31, 19_7

Revenues		\$1,600,000
Costs:		
Salaries and wages	\$970,000	
Rent	180,000	
Depreciation	105,000	
Other costs	<u>187,000</u>	<u>1,442,000</u>
Operating income		<u>\$ 158,000</u>

PANEL B: ELLIOTT & PARTNERS RELATIONSHIP OF CAPITALIZED AND NONCAPITALIZED COSTS



firm receive legal advice and representation on their behalf in court and in negotiations. Salaries and wages constitute 67.3% of total operating costs (\$970,000 ÷ \$1,442,000). The operating-cost line items for service companies will include costs from all areas of the value chain (production of services, marketing, and so on). There is not a line item for cost of goods sold in the income statement of Elliott & Partners. Why? Because the business sells only services or intangible products to its customers.

Exhibit 2-7 (Panel B) shows the relationship between capitalized and noncapitalized costs for service-sector companies. Capitalized costs include the cost of motor vehicles, computers, and similar equipment purchased by Elliott & Partners. These costs are first capitalized and shown in the balance sheet as assets. They are presumed to provide benefits to the company over several periods. Each period part of the cost of these assets is expensed as depreciation—\$105,000 in 19_7. Noncapitalized costs of Elliott, such as salaries and wages (\$970,000) and rent (\$180,000), become expenses immediately as incurred and thus are never shown as assets.

MERCHANDISING- AND MANUFACTURING-SECTOR COMPANIES

Merchandising-sector companies provide tangible products they have previously purchased in the same basic form from suppliers. Merchandise purchased from suppliers but not sold at the end of an accounting period is held as inventory. The merchandising sector includes companies engaged in retailing (such as book stores or department stores), distributing, or wholesaling. **Manufacturing-sector companies** provide tangible products that have been converted to a different form from that of the products purchased from suppliers. At the end of an accounting period, a manufacturer has inventory that can include direct materials, work in process, or finished goods.

Merchandising and manufacturing companies differ from service companies in their holding of inventories. The capitalized costs of merchandising and manufacturing companies can be classified as follows:

OBJECTIVE 6

Differentiate between capitalized costs and noncapitalized costs

- ◆ **Capitalized inventoriable costs** (also called **inventoriable costs**) are those capitalized costs associated with the purchase of goods for resale (in the costs of merchandise inventory) or costs associated with the acquisition and conversion of materials and all other manufacturing inputs into goods for sale (in the case of manufacturing inventories).
- ◆ **Capitalized noninventoriable costs** are those capitalized costs associated with any aspect of business other than inventory.

Capitalized inventoriable costs become part of cost of goods sold in the period in which the inventory item is sold. **Operating costs** are all costs associated with generating revenues, other than cost of goods sold.² They include (1) the period expensing of capitalized noninventoriable costs, and (2) noncapitalized costs. We now consider Prestige Bathrooms (a merchandiser) and Cellular Products (a manufacturer) to illustrate financial statements in these two sectors.

Merchandising-Sector Example

Exhibit 2-8 (Panel A) presents the income statement of Prestige Bathrooms, a merchandiser of bathroom fixtures and furnishings (showers, sinks, hand towels, and so on). A merchandiser's cost of goods sold consists of the cost of goods purchased for resale adjusted for changes in the level of merchandise inventory:

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

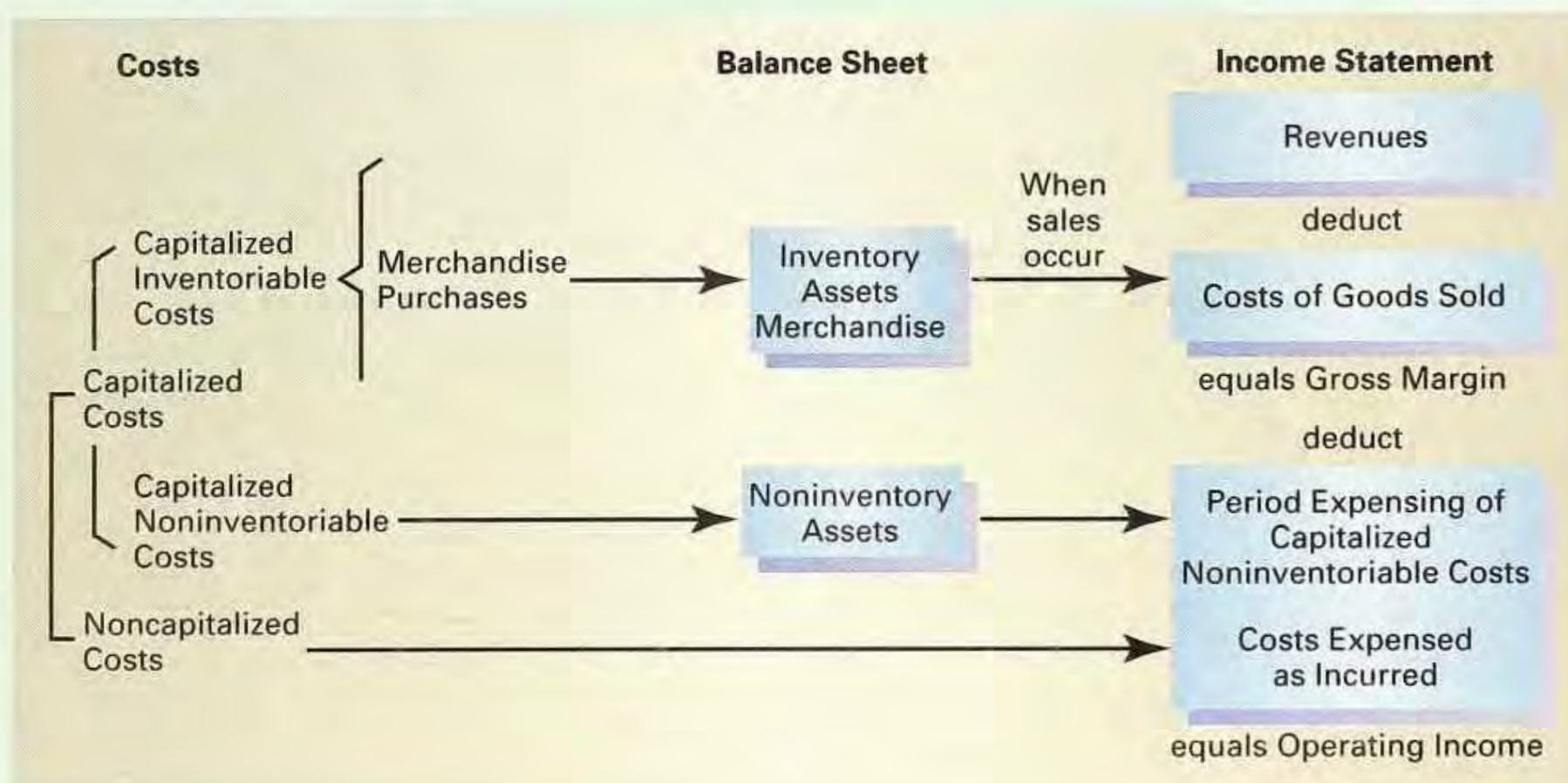
²The term *operating costs* is sometimes used to include cost of goods sold. In this book, we do not include cost of goods sold in operating costs.

EXHIBIT 2-8
Merchandising-Sector Income Statement

PANEL A: PRESTIGE BATHROOMS INCOME STATEMENT FOR THE YEAR ENDED DECEMBER 31, 19_7

Revenues		\$1,500,000
Cost of goods sold		
Beginning merchandise inventory, January 1, 19_7	\$ 95,000	
Purchases of merchandise	<u>1,100,000</u>	
Cost of goods available for sale	1,195,000	
Ending merchandise inventory, December 31, 19_7	<u>130,000</u>	<u>1,065,000</u>
Gross margin (or gross profit)		435,000
Operating costs		<u>315,000</u>
Operating income		<u>\$ 120,000</u>

PANEL B: PRESTIGE BATHROOMS RELATIONSHIP OF CAPITALIZED AND NONCAPITALIZED COSTS



For Prestige Bathrooms in 19_7, the corresponding amounts in Exhibit 2-8 (Panel A) are

$$\$ 95,000 + \$1,100,000 - \$130,000 = \$1,065,000$$

Examples of Prestige's operating costs include the costs of designing the showroom, sales personnel, and advertising.

Exhibit 2-8 (Panel B) shows the relationship between capitalized and noncapitalized costs for merchandising companies. Merchandise purchased for resale is first shown as an asset; its cost is a capitalized inventoriable cost. As the merchandise is sold, its cost becomes an expense of that period in the form of cost of goods sold. Capitalized noninventoriable costs (such as the costs of fixtures, fittings, and computers) are shown on the balance sheet as assets and then become operating cost line items in the form of depreciation (and other forms of asset write-downs) over the useful life of the asset. The \$315,000 operating costs of Prestige in Panel A include depreciation on noninventory assets as well as costs expensed to the period as incurred (such as the salaries of checkout staff and monthly cost of electricity).

Subsequent chapters examine merchandising-sector costs in detail. These costs include cost of goods sold, period expensing of capitalized noninventoriable costs, and costs expensed as incurred (noncapitalized costs).

OBJECTIVE 7

Describe the three categories of inventories commonly found in many manufacturing-sector companies

Manufacturing-Sector Example

The manufacturing sector differs from the merchandising sector in that the products sold to customers are converted to a different form from that of the products purchased from suppliers. This distinction results in the manufacturer having one or more of the following types of inventory:

1. **Direct materials inventory.** Direct materials in stock and awaiting use in the manufacturing process.

EXHIBIT 2-9

Income Statement and Schedule of Cost of Goods Manufactured
of Manufacturing-Sector Company

**PANEL A: CELLULAR PRODUCTS INCOME STATEMENT FOR THE YEAR
ENDED DECEMBER 31, 19_7
(IN THOUSANDS)**

Revenues		\$210,000
Cost of goods sold		
Beginning finished goods, January 1, 19_7	\$ 22,000	
Cost of goods manufactured (see Panel B)	104,000	
Cost of goods available for sale	126,000	
Ending finished goods, December 31, 19_7	18,000	108,000
Gross margin (or gross profit)		102,000
Operating costs		70,000
Operating income		\$ 32,000

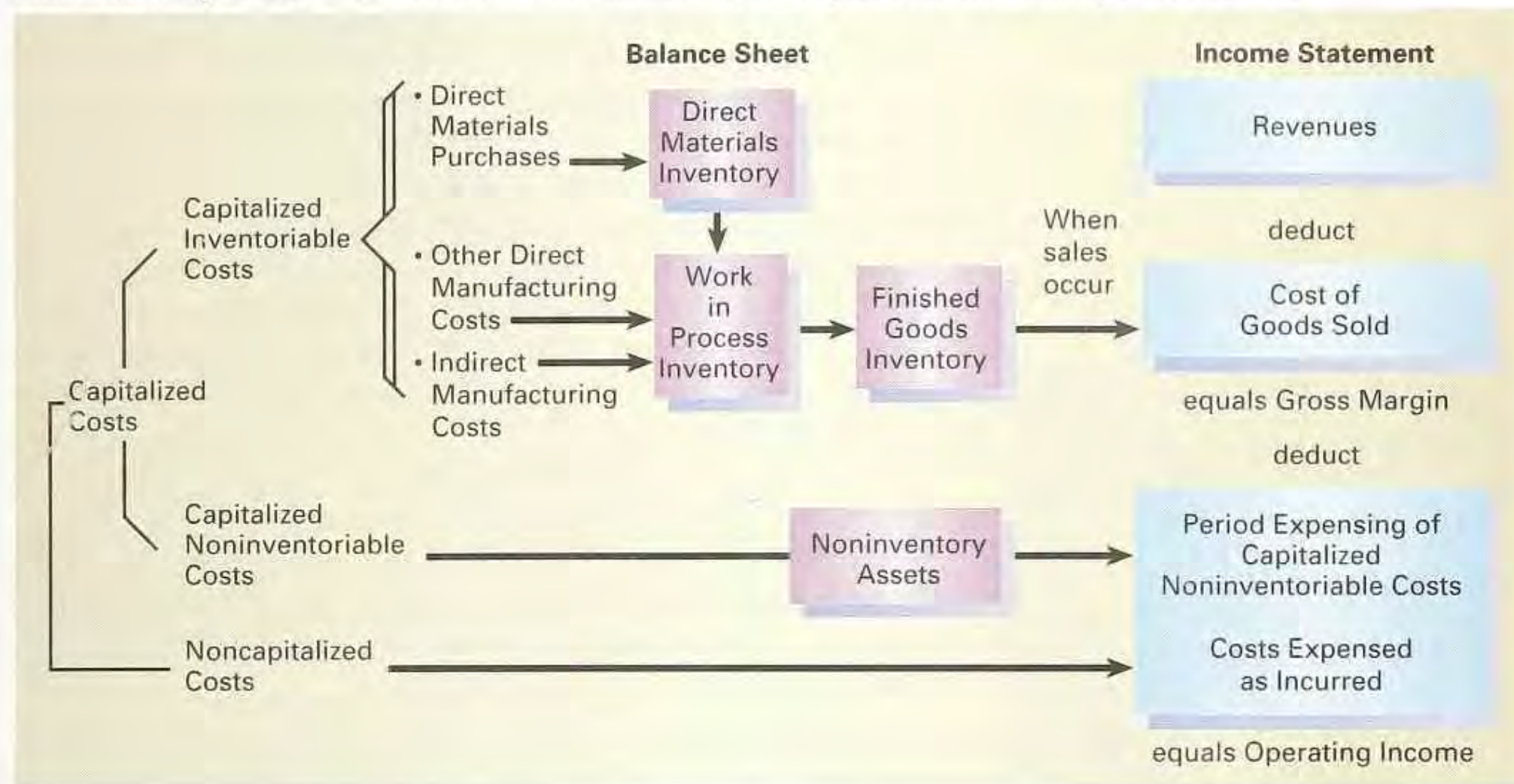
PANEL B: CELLULAR PRODUCTS SCHEDULE OF COST OF GOODS MANUFACTURED* FOR THE YEAR ENDED DECEMBER 31, 19_7 (IN THOUSANDS)

Direct materials		
Beginning inventory, January 1, 19_7	\$ 11,000	
Purchases of direct materials	73,000	
Cost of direct materials available for use	84,000	
Ending inventory, December 31, 19_7	8,000	
Direct materials used		\$ 76,000
Direct manufacturing labor		17,750
Indirect manufacturing costs		
Indirect manufacturing labor	4,000	
Supplies	1,000	
Heat, light, and power	1,750	
Depreciation—plant building	1,500	
Depreciation—plant equipment	2,500	
Miscellaneous	500	11,250
Manufacturing costs incurred during 19_7		105,000
Add beginning work in process inventory, January 1, 19_7		6,000
Total manufacturing costs to account for		111,000
Deduct ending work in process inventory, December 31, 19_7		7,000
Cost of goods manufactured (to income statement)		\$104,000

*Note that the term *cost of goods manufactured* refers to the cost of goods brought to completion (finished) during the year, whether they were started before or during the current year. Some of the manufacturing costs incurred during the year are held back as costs of the ending work in process inventory; similarly, the costs of the beginning work in process inventory become part of the cost of goods manufactured for the year. Note too that this schedule can become a schedule of cost of goods manufactured and sold simply by including the beginning and ending finished goods inventory figures in the supporting schedule rather than directly in the body of the income statement as in Panel A.

EXHIBIT 2-10

Manufacturing-Sector Income Statement: Relationship of Capitalized and Noncapitalized Costs



2. **Work-in-process inventory.** Goods partially worked on but not yet fully completed. Also called **work in progress**.

3. **Finished goods inventory.** Goods fully completed but not yet sold.

In this chapter we assume that all manufacturing costs are inventoriable.³

The income statement of a manufacturer, Cellular Products, is shown in Exhibit 2-9 (Panel A). This company manufactures telephone systems for large organizations. Cost of goods sold in a manufacturing company is computed as follows:

$$\begin{array}{rcccl} \text{Beginning} & & \text{Cost of} & & \text{Ending} & & \text{Cost of} \\ \text{finished goods} & + & \text{goods} & - & \text{finished goods} & = & \text{goods} \\ \text{inventory} & & \text{manufactured} & & \text{inventory} & & \text{sold} \end{array}$$

For Cellular Products in 19_7, the corresponding amounts (in thousands, Panel A) are

$$\$22,000 + \$104,000 - \$18,000 = \$108,000$$

Cost of goods manufactured refers to the cost of goods brought to completion, whether they were started before or during the current accounting period. In 19_7, these costs amount to \$104,000 for Cellular Products (see the schedule of cost of goods manufactured in Panel B of Exhibit 2-9). The manufacturing costs incurred during 19_7 (\$105,000) is a line item in Panel B. This item refers to the “new” direct manufacturing costs and the “new” manufacturing overhead costs that were incurred during 19_7 for all goods worked on during 19_7, regardless of whether all those goods were fully completed during this year.

Exhibit 2-10 shows cost relationships for a manufacturing-sector company. The manufacturing costs of the finished goods include direct materials, other direct manufacturing costs, and indirect manufacturing costs. All these are capitalized inventoriable costs; they are assigned to work-in-process inventory or finished goods inventory until the goods are sold. Capitalized inventoriable costs include the costs of assets that facilitate the manufacturing process and (typically) become part of indirect

³The term *absorption costing* is used to describe the method in which all manufacturing costs are inventoriable. Chapter 9 further discusses this method and two alternative methods—*variable costing*, in which only variable manufacturing costs are inventoriable and *throughput costing*, in which only direct-materials costs are inventoriable.

manufacturing costs in the form of depreciation. For example, the costs of the blast furnace of a steel company are first capitalized at the time of construction. These costs subsequently become part of steel inventory costs as depreciation on the blast furnace is included in indirect manufacturing costs over the useful life of the blast furnace. Newcomers to cost accounting frequently assume that indirect costs such as rent, telephone, and depreciation are always costs of the period in which they are incurred and are unconnected with inventories. However, if these costs are related to manufacturing per se, they are indirect manufacturing costs and are inventoriable. Operating-cost items in the income statement in Panel A of Exhibit 2-9 include (1) the expensing of capitalized noninventoriable costs (such as depreciation on a fleet of delivery vehicles or depreciation on computers purchased for marketing personnel), and (2) the cost of items recorded as an expense as incurred (such as the salaries of customer-service representatives).

MANUFACTURING COSTS

The language of cost accounting has specific terms for manufacturing costs. Three terms in widespread use are direct materials costs, direct manufacturing labor costs, and indirect manufacturing costs.

1. Direct materials costs are the acquisition costs of all materials that eventually become part of the cost object (say, units finished or in process), and that can be traced to the cost object in an economically feasible way. Acquisition costs of direct materials include freight-in (inward delivery) charges, sales taxes, and custom duties.

2. Direct manufacturing labor costs include the compensation of all manufacturing labor that is specifically identified with the cost object (say, units finished or in process), and that can be traced to the cost object in an economically feasible way. Examples include wages and fringe benefits paid to machine operators and assembly-line workers.

3. Indirect manufacturing costs are all manufacturing costs considered to be part of the cost object (say, units finished or in process), but that cannot be individually traced to that cost object in an economically feasible way. Examples include power, supplies, indirect materials, indirect manufacturing labor, plant rent, plant insurance, property taxes on plants, plant depreciation, and the compensation of plant managers. Other terms for this cost category include **manufacturing overhead costs** and **factory overhead costs**. We use *indirect manufacturing costs* and *manufacturing overhead costs* interchangeably in this book.

Three-Part and Two-Part Cost Classifications

Manufacturing-cost accounting systems vary among companies. Some use a three-part classification of manufacturing costs; others use a two-part classification:

THREE-PART CLASSIFICATION	TWO-PART CLASSIFICATION
◆ Direct materials costs	◆ Direct materials costs
◆ Direct manufacturing labor costs	◆ Indirect manufacturing costs
◆ Indirect manufacturing costs	

Accounting systems of organizations often change over time. For example, a company may change from the three-part classification to the two-part classification if direct manufacturing labor costs become immaterial in amount because of increased automation. Other alternatives are also available. A company may change from the three-part classification to one with two direct cost categories and multiple individual manufacturing overhead cost categories. Managers will choose the classification of costs that best helps them in their planning, control, and decision making.

Harley-Davidson Eliminates the Direct Manufacturing Labor Cost Category

For many years, Harley-Davidson's Motorcycle Division used a three-part cost classification in its manufacturing facilities—direct materials, direct manufacturing labor, and manufacturing overhead. In the mid-1980s, a task force of Harley-Davidson managers analyzed how its manufacturing product-cost structure compared with the administrative costs required to collect, inspect, and report data in its accounting system. It found the following information:

	Manufacturing Product-Cost Structure	Administrative Cost Effort
Direct materials	54%	25%
Manufacturing overhead	36	13
Direct manufacturing labor	10	62

The administrative costs associated with tracking direct manufacturing labor as a separate cost category included:

- ◆ operators time to fill out labor tickets
- ◆ supervisors time to review labor tickets
- ◆ timekeepers time to enter the labor data and review the data output reports for errors
- ◆ cost accountants time to review the direct labor and variance data

Harley-Davidson concluded that tracing direct labor to products did not meet a cost-benefit test. Direct labor costs were only 10% of total manufacturing costs but required 62% of the administrative effort used to track all manufacturing costs. The company now includes all manufacturing labor costs as part of manufacturing overhead costs. It uses a two-part classification of direct materials and manufacturing overhead.

Source: Adapted from Turk, "Management Accounting Revitalized: The Harley-Davidson Experience." *Journal of Cost Management* (Winter 1990) and conversations with management.



Prime Costs and Conversion Costs

Two terms used in manufacturing-cost systems are prime costs and conversion costs. **Prime costs** are all direct manufacturing costs. In the three-part classification, prime costs would comprise direct materials costs and direct manufacturing labor costs. In the two-part classification, prime costs would include only direct materials costs. As information-gathering technology improves, companies may add additional direct-cost categories. For example, power costs might be metered in specific areas of a plant that are dedicated totally to the assembly of separate products. In this case, prime costs would include direct materials, direct manufacturing labor, and direct metered power. Computer software companies often have a "purchased technology" direct manufacturing-cost item. This item, which covers payments to third parties who develop software algorithms included in a product, would also be included in prime costs. **Conversion costs** are all manufacturing costs other than direct materials costs. These costs are for transforming direct materials into finished goods. In the three-part classification of manufacturing costs, conversion costs would comprise direct manufacturing labor costs and indirect manufacturing costs. In the two-part classification, conversion costs would be only the indirect manufacturing costs.

The components of prime costs and conversion costs for the three-part and two-part classifications can be summarized as follows:

	Three-part Classification	Two-part Classification
Prime costs	Direct materials costs Direct manufacturing labor costs	Direct materials costs
Conversion costs	Direct manufacturing labor costs Indirect manufacturing costs	Indirect manufacturing costs

BENEFITS OF DEFINING ACCOUNTING TERMS

Differences exist across companies in the way accounting terms are defined. Consider a direct laborer, such as a lathe operator or an assembly-line worker, who earns gross wages computed on the basis of a regular wage rate of \$20 per hour. This person receives fringe benefits (employer contributions to the employee's social security, life insurance, health insurance, and so on) totaling, say, \$8 per hour. Some companies classify the \$20 as direct manufacturing labor cost and the \$8 as manufacturing overhead cost. Other companies classify the entire \$28 as direct manufacturing labor cost. The latter approach is conceptually preferable because these payroll fringe benefit costs are a fundamental part of acquiring manufacturing labor services. The magnitude of fringe benefits makes this issue important. Countries where fringe benefits costs are over 30% of wage rates include Italy (105%), France (90%), Germany (86%), United Kingdom (43%), and the United States (38%).⁴

The problem here is to pinpoint what direct manufacturing labor includes and excludes in a particular situation. Achieving clarity may avoid disputes regarding cost reimbursement contracts, income tax provisions, and labor union matters. For example, some countries offer substantial income tax savings to companies that locate manufacturing plants there. To qualify, the "direct manufacturing labor" costs of these companies in that country must meet a specified minimum percentage of the total manufacturing costs of their products produced there. What incentive does such an income tax provision give managers to classify fringe benefit costs as direct manufacturing labor or manufacturing overhead? Classifying payroll fringe benefit costs as direct manufacturing labor will increase the percentage of direct manufacturing labor costs, thereby making it easier to qualify for the income tax savings. Consider a company with \$8 million of payroll fringe benefit costs (figures are assumed to be in millions):

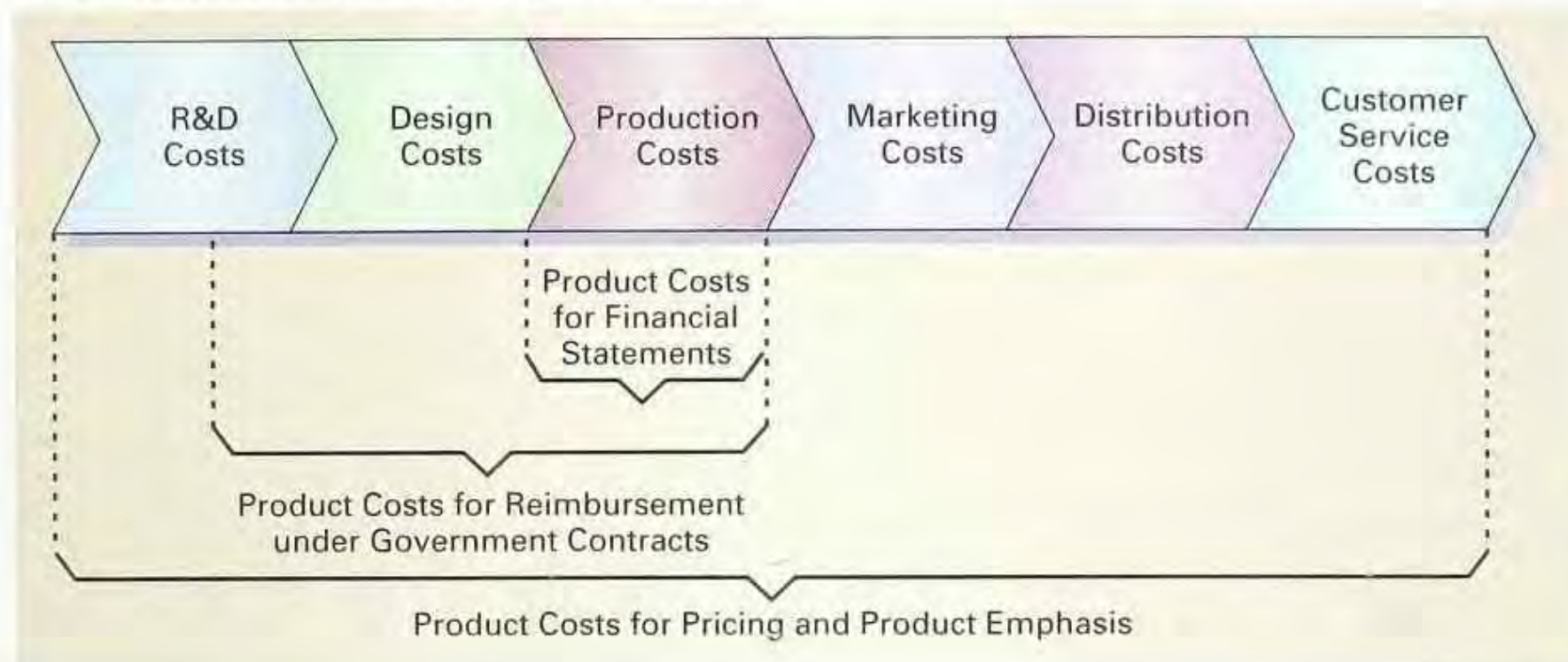
Method A			Method B		
Direct materials	\$ 40	40%	Direct materials	\$ 40	40%
Direct manufacturing labor	20	20	Direct manufacturing labor	28	28
Manufacturing overhead	40	40	Manufacturing overhead	32	32
Total manufacturing costs	<u>\$100</u>	<u>100%</u>	Total manufacturing costs	<u>\$100</u>	<u>100%</u>

Method A classifies payroll fringe benefit costs as part of manufacturing overhead. In contrast, method B classifies payroll fringe benefit costs as part of direct manufacturing labor. If a country set the minimum percentage of direct manufacturing labor costs at 25%, the company would receive a tax savings using method B, but not using method A. In addition to payroll fringe benefits, other items subject to different possible classifications include compensation for training time, idle time, vacations, sick leave, and extra compensation for overtime. To prevent disputes, contracts and laws should be as specific as feasible regarding definitions and measurements of accounting terms.

⁴H. Salowsky, "Labor Costs in Twenty Industrialized Countries, 1970–1991," Institute of the Germany Economy in Cologne, Germany, 1992.

EXHIBIT 2-11

Different Product Costs for Different Purposes



THE MANY MEANINGS OF PRODUCT COSTS

An important theme of this book is “different costs for different purposes.” This theme can be illustrated with respect to product costing. A **product cost** is the sum of the costs assigned to a product for a specific purpose. Exhibit 2-11 illustrates three different purposes:

1. *Product pricing and product emphasis.* For this purpose, the costs of all those areas of the value chain required to bring a product to a customer should be included.
2. *Contracting with government agencies.* Government agencies frequently provide detailed guidelines on the allowable and nonallowable items in a product-cost amount. For example, some government agencies explicitly exclude marketing costs from reimbursement to contractors and may reimburse only a part of R&D costs. Hence, the bracket in Exhibit 2-11 shows that a specific contract may provide for recovering all design and production costs and part of R&D costs.
3. *Financial statements.* The focus here is on inventoriable costs. For example, under generally accepted accounting principles in manufacturing companies, only manufacturing costs are assigned to products reported in the financial statements.

Exhibit 2-11 illustrates how a product-cost amount may include only inventoriable costs in the financial statements, a broader set of costs for reimbursement under a government contract, and a still broader set of costs for pricing and product emphasis.

OBJECTIVE 8

Explain how different ways of computing product costs are appropriate for different purposes

CLASSIFICATIONS OF COSTS

This chapter has provided many examples of cost classifications that have various purposes. Classifications can be made on the basis of

1. Business function
 - a. Research and development
 - b. Design of products, services, and processes
 - c. Production
 - d. Marketing
 - e. Distribution
 - f. Customer service
2. Assignment to a cost object
 - a. Direct costs
 - b. Indirect costs

3. Behavior pattern in relation to changes in the level of a cost driver
 - a. Variable costs
 - b. Fixed costs
4. Aggregate or average
 - a. Total costs
 - b. Unit costs
5. Costs in financial statements
 - a. Capitalized costs
 - i. Capitalized inventoriable costs
 - ii. Capitalized noninventoriable costs
 - b. Noncapitalized costs

PROBLEM FOR SELF-STUDY

(Try to solve this problem before examining the solution that follows.)

PROBLEM

Campbell Company is a metal and wood cutting manufacturer, selling products to the home construction market. Consider the following data for the year 19_7:

Sandpaper	\$ 2,000
Materials-handling costs	70,000
Lubricants and coolants	5,000
Miscellaneous indirect manufacturing labor	40,000
✓ Direct manufacturing labor	300,000
✓ Direct materials, January 1, 19_7	40,000
Finished goods, January 1, 19_7	100,000
Finished goods, December 31, 19_7	150,000
Work in process, January 1, 19_7	10,000
Work in process, December 31, 19_7	14,000
Plant-leasing costs	54,000
Depreciation—plant equipment	36,000
Property taxes on plant equipment	4,000
Fire insurance on plant equipment	3,000
Direct materials purchased	460,000
Direct materials, December 31, 19_7	50,000
Revenue	1,360,000
Marketing promotions	60,000
Marketing salaries	100,000
Shipping costs	70,000
Customer-service costs	100,000

REQUIRED

1. Prepare an income statement with a separate supporting schedule of cost of goods manufactured. For all manufacturing items, indicate by V or F whether each is basically a variable cost or a fixed cost (where the cost object is a product unit). If in doubt, decide on the basis of whether the total cost will change substantially over a wide range of production output.
2. Suppose that both the direct materials and plant-leasing costs are tied to the production of 900,000 units. What is the unit cost for the direct materials assigned to each unit produced? What is the unit cost of the plant-leasing costs? Assume that the plant-leasing costs are a fixed cost.
3. Repeat the computation in requirement 2 for direct materials and plant-leasing costs, assuming that the costs are being predicted for the manufacturing of 1 million units next year. Assume that the implied cost behavior patterns persist.

4. As a management consultant, explain concisely to the president why the unit costs for direct materials did not change in requirements 2 and 3 but the unit costs for plant-leasing costs did.

SOLUTION

1.

CAMPBELL COMPANY Income Statement for the Year Ended December 31, 19_7

Revenue		\$1,360,000
Cost of goods sold		
Beginning finished goods, January 1, 19_7	\$ 100,000	
Cost of goods manufactured (see below)	<u>960,000</u>	
Cost of goods available for sale	1,060,000	
Ending finished goods, December 31, 19_7	<u>150,000</u>	<u>910,000</u>
Gross margin (or gross profit)		450,000
Operating costs		
Marketing promotions	60,000	
Marketing salaries	100,000	
Distribution costs	70,000	
Customer-service costs	<u>100,000</u>	<u>330,000</u>
Operating income		<u>\$ 120,000</u>

CAMPBELL COMPANY Schedule of Cost of Goods Manufactured For the Year Ended December 31, 19_7

Direct materials		
Beginning inventory, January 1, 19_7	\$ 40,000	
Purchases of direct materials	<u>460,000</u>	
Cost of direct materials available for use	500,000	
Ending inventory, December 31, 19_7	<u>50,000</u>	
Direct materials used		\$450,000 (V)
Direct manufacturing labor		300,000 (V)
Indirect manufacturing costs		
Sandpaper	\$ 2,000 (V)	
Materials handling cost	70,000 (V)	
Lubricants and coolants	5,000 (V)	
Miscellaneous indirect manufacturing labor	40,000 (V)	
Plant-leasing costs	54,000 (F)	
Depreciation—plant equipment	36,000 (F)	
Property taxes on plant equipment	4,000 (F)	
Fire insurance on plant equipment	<u>3,000 (F)</u>	<u>214,000</u>
Manufacturing costs incurred during 19_7		964,000
Add beginning work in process inventory, January 1, 19_7		<u>10,000</u>
Total manufacturing costs to account for		974,000
Deduct ending work in process inventory, December 31, 19_7		<u>14,000</u>
Cost of goods manufactured (to income statement)		<u>\$960,000</u>

2. Direct materials unit cost = Direct materials used ÷ Units produced
 = \$450,000 ÷ 900,000 = \$0.50
 Plant-leasing unit cost = Plant-leasing costs ÷ Units produced
 = \$54,000 ÷ 900,000 = \$0.06

3. The direct materials costs are variable, so they would increase in total from \$450,000 to \$500,000 ($1,000,000 \times \$0.50$). However, their unit costs would be unaffected: $\$500,000 \div 1,000,000 \text{ units} = \0.50 .

In contrast, the plant-leasing costs of \$54,000 are fixed, so they would not increase in total. However, if the plant-leasing costs were assigned to units produced, the unit costs would decline from \$0.060 to \$0.054: $\$54,000 \div 1,000,000 = \0.054 .

4. The explanation would begin with the answer to requirement 3. As a consultant, you should stress that the unitizing (averaging) of costs that have different behavior patterns can be misleading. A common error is to assume that a total unit cost, which is often a sum of variable unit costs and fixed unit costs, is an indicator that total costs change in a wholly variable way as the level of production output changes. The next chapter demonstrates the necessity for distinguishing between cost behavior patterns. You must be especially wary about unit fixed costs. Too often, unit fixed costs are erroneously regarded as being indistinguishable from unit variable costs.

SUMMARY

The following points are linked to the chapter's learning objectives.

1. A cost object is anything for which a separate measurement of costs is desired. Examples include a product, service, project, customer, brand category, activity, department, and program.
2. A direct cost of a cost object is any cost that is related to the cost object and can be traced to that cost object in an economically feasible way. Indirect costs are costs that are related to the cost object but cannot be traced to that cost object in an economically feasible way. A cost may be direct regarding one cost object and indirect regarding other cost objects. This book uses the term *cost tracing* to describe the assignment of direct costs to a cost object and the term *cost allocation* to describe the assignment of indirect costs to a cost object.
3. A cost driver is any factor that affects costs. Examples include the number of setups and direct-labor hours in manufacturing and the number of sales personnel and sales dollars in marketing. A variable cost is a cost that does change in total in proportion to changes in a cost driver. A fixed cost is a cost that does not change in total despite changes in a cost driver.
4. Unit costs of a cost object should be interpreted with caution when they include a fixed-cost component. When making total cost estimates, think of variable costs as an amount per unit and fixed costs as a total amount.
5. Service-sector companies provide services or intangible products to their customers. In contrast, merchandising- and manufacturing-sector companies provide tangible products to their customers. Merchandising companies do not change the form of the products they acquire and sell. Manufacturing companies convert materials and other inputs into finished goods for sale. These differences are reflected in both the balance sheets and income statements of companies in these sectors.
6. Capitalized costs are first recorded as an asset (capitalized) when they are incurred. These costs are presumed to provide future benefits to the company. Non-capitalized costs are recorded as expenses when they are incurred.
7. The three categories of inventory found in many manufacturing-sector companies depict stages in the conversion process—direct materials, work in process, and finished goods.

8. Managers may assign different costs to the same cost object depending on their purpose. For example, for financial reporting purposes, the (inventoriable) costs of a product include only manufacturing costs. In contrast, costs from all areas of the value chain can be assigned to a product for decisions on pricing and product emphasis.

TERMS TO LEARN

This chapter contains more basic terms than any other in this book. Do not proceed before you check your understanding of the following terms. You will find definitions of these terms in both this chapter and the Glossary at the end of this book.

actual costs (p. 26)	fixed cost (29)
average cost (32)	indirect costs of a cost object (27)
capitalized costs (35)	indirect manufacturing costs (40)
capitalized inventoriable costs (36)	inventoriable costs (36)
capitalized noninventoriable costs (36)	manufacturing overhead costs (40)
conversion costs (41)	manufacturing-sector company (36)
cost (26)	merchandising-sector company (36)
cost accumulation (26)	noncapitalized costs (35)
cost allocation (27)	operating costs (36)
cost assignment (26)	prime costs (41)
cost driver (28)	product cost (43)
cost object (26)	relevant range (30)
cost tracing (27)	service-sector company (35)
direct costs of a cost object (27)	unit cost (32)
direct manufacturing labor costs (40)	value-added activities (28)
direct materials costs (40)	variable cost (29)
direct materials inventory (38)	work-in-process inventory (39)
factory overhead costs (40)	work in progress (39)
finished goods inventory (39)	

ASSIGNMENT MATERIAL

QUESTIONS

- 2-1 Define *cost object* and give three examples.
- 2-2 Define *cost assignment*, *cost tracing*, and *cost allocation*. How are these terms related?
- 2-3 Which costs are considered direct? Indirect? Give an example of each.
- 2-4 Describe how a given cost item can be both a direct cost and an indirect cost.
- 2-5 Give three factors that will affect the classification of a cost as direct or indirect.
- 2-6 Describe two areas that cost reduction efforts frequently focus on.
- 2-7 What is a *cost driver*? Give one example for each area in the value chain.
- 2-8 Define *variable cost* and *fixed cost*. Give an example of each.
- 2-9 What is the *relevant range*? What role does the relevant range concept play in explaining how costs behave?
- 2-10 Explain why *unit costs* must often be interpreted with caution.
- 2-11 Describe how service-, merchandising-, and manufacturing-sector companies differ from each other.

- 2-12 Distinguish between *capitalized costs* and *noncapitalized costs*. Give an example of each from the service, merchandising, and manufacturing sectors.
- 2-13 What are the three major categories of the inventoriable costs of a manufactured product?
- 2-14 Define the following: *direct materials costs*, *direct manufacturing labor costs*, *indirect manufacturing costs*, *prime costs*, and *conversion costs*.
- 2-15 Define *product costs*. Describe three different purposes for computing product costs.

EXERCISES

- 2-16 **Total costs and unit costs.** A student association has hired a musical group for a graduation party. The cost will be a fixed amount of \$4,000.

REQUIRED

- Suppose 500 people attend the party. What will be the total cost of the musical group? The unit cost per person?
- Suppose 2,000 people attend. What will be the total cost of the musical group? The unit cost per person?
- For prediction of total costs, should the manager of the party use the unit cost in requirement 1? The unit cost in requirement 2? What is the major lesson of this problem?

- 2-17 **Total costs and unit costs.** Nathan Brown is a well-known motivational speaker. The St. George Speaker's Bureau wants Brown to be the sole speaker at an all-day seminar. Brown's agent offers St. George the choice of three possible fee arrangements:

- ◆ Schedule 1: \$8,000 fee
- ◆ Schedule 2: \$20 per person + \$2,000 fixed fee
- ◆ Schedule 3: \$50 per person

Each attendee will be charged a \$200 fee for the all-day seminar.

REQUIRED

- What is St. George's fixed cost and variable cost for hiring Brown under each alternative schedule?
- For each schedule, compute the total cost and unit cost per seminar attendee if (a) 50 attend, (b) 200 attend, and (c) 500 attend. Comment on the results.

- 2-18 **Total costs and unit costs.** Golden Holidays markets vacation packages to Honolulu from Los Angeles. The package includes a round-trip flight on Global Airways. Golden Holidays pays Global \$60,000 for each round-trip flight. The maximum load on a flight is 300 passengers.

REQUIRED

- What is the unit cost to Golden Holidays of each passenger on a Global Airways round-trip flight if there are (a) 200, (b) 250, or (c) 300 passengers?
- What role can the unit-cost figures per passenger computed in requirement 1 play when Golden Holidays is predicting the total air-flight costs to be paid next month for Global Airways carrying 4,000 passengers on 15 scheduled round-trip flights?

- 2-19 **Cost drivers and the value chain.** A Johnson & Johnson analyst is preparing a presentation on cost drivers at its pharmaceutical drug subsidiary. Unfortunately, both the list of its business function areas and the accompanying list of representative cost drivers is accidentally randomized. The two lists now on the computer screen are as follows:

BUSINESS FUNCTION AREA	REPRESENTATIVE COST DRIVER
A. Production	1. Minutes of television advertising time on "60 Minutes"
B. Research and Development	2. Number of calls to toll-free customer phone line

- | | |
|---------------------------------|---|
| C. Marketing | 3. Hours Tylenol packing line in operation |
| D. Distribution | 4. Number of packages shipped |
| E. Design of Products/Processes | 5. Hours spent designing tamper-proof bottles |
| F. Customer Service | 6. Number of patents filed with government agency |

REQUIRED

1. Match each business function area with its representative cost driver.
2. Give a second example of a cost driver for each of the business functions of Johnson & Johnson's pharmaceutical drug subsidiary.

2-20 Cost drivers and the value chain. A Toyota analyst is preparing a presentation on cost drivers. Unfortunately, both the list of its business function areas and the accompanying list of representative cost drivers is accidentally randomized. The two lists now on the computer screen are as follows:

BUSINESS FUNCTION AREA	REPRESENTATIVE COST DRIVER
A. Design of Products/Processes	1. Number of cars recalled for defective parts
B. Customer Service	2. Number of machine assembly hours
C. Marketing	3. Number of research scientists
D. Research and Development	4. Hours of computer-aided design (CAD) work
E. Distribution	5. Number of sales personnel
F. Production	6. Weight of cars shipped

REQUIRED

1. Match each business function area with its representative cost driver.
2. Give a second example of a cost driver for each of the business function areas of Toyota.

2-21 Variable costs and fixed costs. Consolidated Minerals (CM) owns the rights to extract minerals from beach sands on Fraser Island. CM has costs in three areas:

- a. Payment to a mining subcontractor who charges \$80 per ton of beach sand mined and returned to the beach (after being processed on the mainland to extract three minerals—ilmenite, rutile, and zircon).
- b. Payment of a government mining and environmental tax of \$50 per ton of beach sand mined.
- c. Payment to a barge operator. This operator charges \$150,000 per month to transport each batch of beach sand—up to 100 tons per batch per day to the mainland and then return to Fraser Island (that is, 0–100 tons per day = \$150,000 per month; 101–200 tons = \$300,000 per month, and so on). Each barge operates 25 days per month. The \$150,000 monthly charge must be paid even if less than 100 tons are transported on any day and even if Consolidated Minerals requires fewer than 25 days of barge transportation in that month.

CM is currently mining 180 tons of beach minerals per day for 25 days per month.

REQUIRED

1. What is the variable cost per ton of beach sand mined? What is the fixed cost to CM per month?
2. Plot one graph of the variable costs and another graph of the fixed costs of CM. Your plots should be similar to Exhibits 2-4 and 2-5. Is the concept of relevant range applicable to your plots?
3. What is the unit cost per ton of beach sand mined (a) if 180 tons are mined each day, or (b) if 220 tons are mined each day? Explain the difference in the unit-cost figures.

2-22 Classification of costs, service sector. Consumer Focus is a marketing research firm that organizes focus groups for consumer product companies. Each focus group has eight individuals who are paid \$50 per session to provide comments on new products. These focus groups meet in hotels and are led by a trained independent marketing specialist hired by Consumer Focus. Each specialist is paid a fixed retainer to conduct a minimum number of sessions and a per-session fee of \$2,000. A Consumer Focus staff member attends each session to ensure that all the logistical aspects run smoothly.

REQUIRED

Classify each of the following cost items as:

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

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

Cost Item	D or I	V or F
A. Payment to individuals in each focus group to provide comments on new products		
B. Annual subscription of Consumer Focus to <i>Consumer Reports</i> magazine		
C. Phone calls made by Consumer Focus staff member to confirm individuals will attend a focus group session (Records of individual calls are not kept.)		
D. Retainer paid to focus group leader to conduct 20 focus groups per year on new medical products		
E. Hotel meals provided to participants in each focus group		
F. Lease payment by Consumer Focus for corporate office		
G. Cost of tapes used to record comments made by individuals in a focus group session (These tapes are sent to the company whose products are being tested.)		
H. Gasoline costs of Consumer Focus staff for company-owned vehicles (Staff members submit monthly bills with no mileage breakdowns.)		

2-23 Classification of costs, merchandising sector. Home Entertainment Center (HEC) operates a large store in San Francisco. The store has both a video section and a musical (compact disks, records, and tapes) section. HEC reports revenues for the video section separately from the musical section.

REQUIRED

Classify each of the following cost items as:

- Direct or indirect (D or I) costs with respect to the video section.
- Variable or fixed (V or F) costs with respect to how the total costs of the video section change as the number of videos sold changes. (If in doubt, select the cost type on the basis of whether the total costs will change substantially if a large number of videos are sold.)

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

Cost Item	D or I	V or F
A. Annual retainer paid to a video distributor		
B. Electricity costs of HEC store (single bill covers entire store)		
C. Costs of videos purchased for sale to customers		
D. Subscription to <i>Video Trends</i> magazine		
E. Leasing of computer software used for financial budgeting at HEC store		
F. Cost of popcorn provided free to all customers of HEC		
G. Earthquake insurance policy for HEC store		
H. Freight-in costs of videos purchased by HEC		

2-24 Classification of costs, manufacturing sector. The Fremont, California, plant of NUMMI (New United Motor Manufacturing, Inc.), a joint venture of General Motors and Toyota, assembles two types of cars (Corollas and Geo Prisms). Separate assembly lines are used for each type of car.

REQUIRED

Classify each of the following cost items as:

- Direct or indirect (D or I) costs with respect to the type of car assembled (Corolla or Geo Prism).
- Variable or fixed (V or F) costs with respect to how the total costs of the plant change as the number of cars assembled changes. (If in doubt, select the cost type on the basis of whether the total costs will change substantially if a large number of cars are assembled.)

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

Cost Item	D or I	V or F
A. Cost of tires used on Geo Prisms		
B. Salary of public relations manager for NUMMI plant		
C. Annual awards dinner for Corolla suppliers		
D. Salary of engineer who monitors design changes on Geo Prism		
E. Freight costs of Corolla engines shipped from Toyota City, Japan, to Fremont, California		
F. Electricity costs for NUMMI plant (single bill covers entire plant)		
G. Wages paid to temporary assembly-line workers hired in periods of high production (paid on an hourly basis)		
H. Annual fire insurance policy cost for NUMMI plant		

2-25 Capitalized or Noncapitalized costs. Consider the following ten cost items, three pertaining to the service sector, three to merchandising, and four to manufacturing.

SERVICE (ACCOUNTING FIRM)

- \$200,000—cost of computers purchased
- \$47,560—cost of monthly rental for offices
- \$148,386—wages of secretaries

MERCHANDISING (HOME FURNISHING RETAIL STORE)

- \$6,854—cost of bonuses to salespeople
- \$146,540—cost of merchandise purchased for resale
- \$3,470—electricity cost for showroom lighting

MANUFACTURING (STEEL COMPANY)

- \$14,674,080—cost of new blast furnace
- \$641,030—wages of production workers in steel plant
- \$1,246,031—cost of coal to be used as material input in the manufacture of steel
- \$460,174—cost of vehicles purchased for salespeople

REQUIRED

- Classify each of the ten items as a capitalized or a noncapitalized cost for balance sheet and income statement reporting purposes.
- For each capitalized cost item in requirement 1, explain why it is either a capitalized inventoriable cost or a capitalized noninventoriable cost.

2-26 Computing cost of goods manufactured and cost of goods sold. Compute cost of goods manufactured and cost of goods sold from the following account balances relating to 19_7 (in thousands):

Property tax on plant building	\$ 3,000
Marketing, distribution, and customer-service costs	37,000
Finished goods inventory, January 1, 19_7	27,000

Plant utilities	17,000
Work in process inventory, December 31, 19_7	26,000
Depreciation of plant building	9,000
General and administrative costs (nonplant)	43,000
Direct materials used	87,000
Finished goods inventory, December 31, 19_7	34,000
Depreciation of plant equipment	11,000
Plant repairs and maintenance	16,000
Work in process inventory, January 1, 19_7	20,000
Direct manufacturing labor	34,000
Indirect manufacturing labor	23,000
Indirect materials used	11,000
Miscellaneous plant overhead	4,000

2-27 Classification of costs, prime and conversion costs. Tanaka Metal Products reports the following components in its manufacturing costs for April 19_7 (in thousands):

Direct costs:			
Direct materials	¥ 430		
Direct manufacturing labor salaries	110		
Subcontracting	120	¥	660
Manufacturing overhead:			
Fringe benefits on direct manufacturing labor	40		
Production setup	60		
Other manufacturing overhead	240		340
			<u>¥ 1,000</u>

Subcontracting costs are treated as a direct-cost item separate from direct materials.

REQUIRED

1. Compute (a) the prime costs and (b) the conversion costs of Tanaka Metal Products using the cost classifications described above.
2. Assume now that Tanaka changes the classification of two items—both fringe benefits on direct manufacturing labor and production setups will now be classified as direct costs. Compute (a) the prime costs and (b) the conversion costs of Tanaka after this change in cost classification, and comment on the results.
3. What information might Tanaka use to change the two items in requirement 2 to be direct-cost items rather than manufacturing overhead cost items?

PROBLEMS

H 2-28 Cost of goods manufactured. Consider the following account balances (in thousands) for the Canseco Company:

	Beginning of 19_7	End of 19_7
Direct materials inventory	\$22,000	\$26,000
Work in process inventory	21,000	20,000
Finished goods inventory	18,000	23,000
Purchases of direct materials		75,000
Direct manufacturing labor		25,000
Indirect manufacturing labor		15,000
Plant insurance		9,000
Depreciation—plant building and equipment		11,000
Repairs and maintenance—plant		4,000
Marketing, distribution, and customer-service costs		93,000
General and administrative costs		29,000

REQUIRED

1. Prepare a schedule of cost of goods manufactured for 19_7.
2. Revenues in 19_7 were \$300 million. Prepare the 19_7 income statement.

2-29 Income statement and schedule of cost of goods manufactured. The Howell Corporation has the following account balances (in millions):

For Specific Date		For Year 19_7	
Direct materials, January 1, 19_7	\$15	Purchases of direct materials	\$325
Work in process, January 1, 19_7	10	Direct manufacturing labor	100
Finished goods, January 1, 19_7	70	Depreciation—plant building and equipment	80
Direct materials, December 31, 19_7	20	Plant supervisory salaries	5
Work in process, December 31, 19_7	5	Miscellaneous plant overhead	35
Finished goods, December 31, 19_7	55	✓ Revenues	950
		✓ Marketing, distribution, and customer-service costs	240
		Plant supplies used	10
		Plant utilities	30
		Indirect manufacturing labor	60

REQUIRED

Prepare an income statement and a supporting schedule of cost of goods manufactured for the year ended December 31, 19_7. (For additional questions regarding these facts, see the next problem.)

2-30 Interpretation of statements (continuation of 2-29). Refer to the preceding problem.

REQUIRED

1. How would the answer to the preceding problem be modified if you were asked for a schedule of cost of goods manufactured and sold instead of a schedule of cost of goods manufactured? Be specific.
2. Would the sales manager's salary (included in marketing, distribution, and customer-service costs) be accounted for differently if the Howell Corporation were a merchandising company instead of a manufacturing company? Using the flow of costs outlined in Exhibit 2-10, describe how the wages of an assembler in the plant would be accounted for in this manufacturing company.
3. Plant supervisory salaries are usually regarded as indirect manufacturing costs. Under what conditions might some of these costs be regarded as direct manufacturing costs? Give an example.
4. Suppose that both the direct materials used and the plant depreciation were related to the manufacture of 1 million units of product. What is the unit cost for the direct materials assigned to those units? What is the unit cost for plant building and equipment depreciation? Assume that yearly plant depreciation is computed on a straight-line basis.
5. Assume that the implied cost behavior patterns in requirement 4 persist. That is, direct materials costs behave as a variable cost and depreciation behaves as a fixed cost. Repeat the computations in requirement 4, assuming that the costs are being predicted for the manufacture of 1.2 million units of product. How would the total costs be affected?
6. As a management accountant, explain concisely to the president why the unit costs differed in requirements 4 and 5.

2-31 Income statement and schedule of cost of goods manufactured. The following items (in millions) pertain to the Chan Corporation:

For Specific Date		For Year 19_7	
Work in process, January 1, 19_7	\$10	Plant utilities	\$ 5
Direct materials, December 31, 19_7	5	Indirect manufacturing labor	20
Finished goods, December 31, 19_7	12	Depreciation—plant, building, and equipment	9
Accounts payable, December 31, 19_7	20	Revenues	350
Accounts receivable, January 1, 19_7	50	Miscellaneous manufacturing overhead	10
Work in process, December 31, 19_7	2	Marketing, distribution, and customer-service costs	90
Finished goods, January 1, 19_7	40	Purchases of direct materials	80
Accounts receivable, December 31, 19_7	30	Direct manufacturing labor	40
Accounts payable, January 1, 19_7	40	Plant supplies used	6
Direct materials, January 1, 19_7	30	Property taxes on plant	1

Chan's manufacturing cost system uses a three-part classification of direct materials, direct manufacturing labor, and indirect manufacturing costs.

REQUIRED

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

2-32 Interpretation of statements (continuation of 2-31). Refer to the preceding problem.

REQUIRED

- How would the answer to the preceding problem be modified if you were asked for a schedule of cost of goods manufactured and sold instead of a schedule of cost of goods manufactured? Be specific.
- Would the sales manager's salary (included in marketing, distribution, and customer-service costs) be accounted for any differently if the Chan Corporation were a merchandising company instead of a manufacturing company? Using the flow of costs outlined in Exhibit 2-10, describe how the wages of an assembler in the plant would be accounted for in this manufacturing company.
- Plant supervisory salaries are usually regarded as indirect manufacturing costs. Under what conditions might some of these costs be regarded as direct manufacturing costs? Give an example.
- Suppose that both the direct materials used and the plant depreciation were related to the manufacture of 1 million units of product. What is the unit cost for the direct materials assigned to those units? What is the unit cost for plant building and equipment depreciation? Assume that yearly depreciation is computed on a straight-line basis.
- Assume that the implied cost behavior patterns in requirement 4 persist. That is, direct materials costs behave as a variable cost and plant depreciation behaves as a fixed cost. Repeat the computations in requirement 4, assuming that the costs are being predicted for the manufacture of 1.5 million units of product. How would the total costs be affected?
- As a management accountant, explain concisely to the president why the unit costs differed in requirements 4 and 5.

2-33 Finding unknown balances, merchandising. The following amounts (in thousands) relate to the income statements of two merchandising companies:

	Company M	Company N
Operating costs	\$ A	\$ 383
Cost of goods available for sale	662	1,238
Gross margin	256	W

	Company M	Company N
Beginning merchandise inventory, January 1, 19_7	B	64
Revenues	C	1,647
Operating income	52	X
Ending merchandise inventory, December 31, 19_7	24	Y
Purchases of merchandise	643	Z
Cost of goods sold	D	1,189

REQUIRED

1. Reconstruct the income statements of the two merchandising companies.
2. Give an example of a cost in each of the following three categories for a merchandiser:
 - a. capitalized inventoriable cost
 - b. capitalized noninventoriable cost
 - c. noncapitalized cost

2-34 Finding unknown balances. An auditor for the Internal Revenue Service is trying to reconstruct some partially destroyed records of two taxpayers. For each of the cases in the accompanying list, find the unknowns designated by capital letters (figures are assumed to be in thousands).

	Case 1	Case 2
Accounts receivable, December 31, 19_7	\$ 6,000	\$ 2,100
Cost of goods sold	A	20,000
Accounts payable, January 1, 19_7	3,000	1,700
Accounts payable, December 31, 19_7	1,800	1,500
Finished goods inventory, December 31, 19_7	B	5,300
Gross margin	11,300	C
Work in process, January 1, 19_7	0	800
Work in process, December 31, 19_7	0	3,000
Finished goods inventory, January 1, 19_7	4,000	4,000
Direct material used	8,000	12,000
Direct manufacturing labor	3,000	5,000
Indirect manufacturing costs	7,000	D
Purchases of direct material	9,000	7,000
Revenues	32,000	31,800
Accounts receivable, January 1, 19_7	2,000	1,400

2-35 Fire loss, computing inventory costs. A distraught employee, Guy Arson, put a torch to a manufacturing plant on a blustery February 26. The resulting blaze completely destroyed the plant and its contents. Fortunately, certain accounting records were kept in another building. They revealed the following for the period from January 1, 19_7 to February 26, 19_7:

Direct materials purchased	\$160,000
Work in process, January 1, 19_7	\$ 34,000
Direct materials, January 1, 19_7	\$ 16,000
Finished goods, January 1, 19_7	\$ 30,000
Indirect manufacturing costs	40% of conversion costs
Revenues	\$500,000
Direct manufacturing labor	\$180,000
Prime costs	\$294,000
Gross margin percentage based on sales	20%
Cost of goods available for sale	\$450,000

The loss was fully covered by insurance. The insurance company wants to know the historical cost of the inventories as one factor considered when negotiating a settlement.

REQUIRED

Calculate the cost of

1. finished goods inventory, February 26, 19_7
2. work-in-process inventory, February 26, 19_7
3. direct materials inventory, February 26, 19_7

- 2-36 Comprehensive problem on unit costs, product costs.** Tampa Office Equipment manufactures and sells metal shelving. It began operations on January 1, 19_7. Costs incurred for 19_7 (V stands for variable; F stands for fixed) are as follows:

Direct materials used costs	\$140,000 V
Direct manufacturing labor costs	30,000 V
Plant energy costs	5,000 V
Indirect manufacturing labor costs	10,000 V
Indirect manufacturing labor costs	16,000 F
Other indirect manufacturing costs	8,000 V
Other indirect manufacturing costs	24,000 F
Marketing, distribution, and customer-service costs	122,850 V
Marketing, distribution, and customer-service costs	40,000 F
Administrative costs	50,000 F

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

Inventory data are as follows:

	Beginning, January 1, 19_7	Ending, December 31, 19_7
Direct materials	0 pounds	2,000 pounds
Work in process	0 units	0 units
Finished goods	0 units	? units

Production in 19_7 was 100,000 units. Two pounds of direct materials are used to make one unit of finished product.

Revenues in 19_7 were \$436,800. The selling price per unit and the purchase price per pound of direct materials were stable throughout the year. The company's ending inventory of finished goods is carried at the average unit manufacturing costs for 19_7. Finished goods inventory, at December 31, 19_7, was \$20,970.

REQUIRED

1. Direct materials inventory, total cost, December 31, 19_7.
2. Finished goods inventory, total units, December 31, 19_7.
3. Selling price per unit, 19_7.
4. Operating income, 19_7. Show your computations.

- 2-37 Budgeted income statement (continuation of 2-36).** Assume management predicts that the selling price per unit and variable cost per unit will be the same in 19_8 as in 19_7. Fixed manufacturing costs and marketing, distribution, and customer-service costs in 19_8 are also predicted to be the same as in 19_7. Sales in 19_8 are forecast to be 122,000 units. The desired ending inventory of finished goods, December 31, 19_8, is 12,000 units. Assume zero ending inventories of both direct materials and work in process. The company's ending inventory of finished goods is carried at the average unit manufacturing costs for 19_8. The company uses the first-in, first-out inventory method. Management has asked that you prepare a budgeted income statement for 19_8.

REQUIRED

1. Units of finished goods produced in 19_8.
2. Budgeted income statement for 19_8.

2-38 Revenue and cost recording and classifications, ethics. Country Outfitters (C.O.) designs and markets jeans to many retailers and distributors around the globe. Its corporate headquarters is in Los Angeles, California. Manufacturing is done by a subcontractor (Jeans West) on the island state of Caribe. The Caribe government grants locally owned companies a 20% income tax rebate if the ratio of their domestic labor costs to total costs exceeds 25%. Domestic labor costs are defined as the employment costs of all employees who are citizens of Caribe. Nicola Roberts, the newly appointed controller of C.O., has recently been examining payments made to Jeans West. She observes that Jeans West purchases denim from C.O. (\$3 million in 19_7). C.O. paid Jeans West \$12 million for the jeans manufactured in Caribe in 19_7. Based on her industry experience, the \$12 million amount is very low. She was told it was “a great deal” for C.O. There is also a sizable payment by C.O. to the Swiss subsidiary of Jeans West (\$4.8 million in 19_7). Roberts is told by the Jeans West president that this payment is for fabric design work that Jeans West does with C.O. C.O. has included the \$4.8 million payments in its own product design cost. The director of product design at C.O. told Roberts it is an “off-statement” item that historically he has no responsibility for nor any say about. To his knowledge, Jeans West uses only C.O. designs with either zero or minimal changes.

Jeans West’s domestic labor costs in 19_7 were \$3.6 million while its total costs were \$10 million. Included in this \$3.6 million was \$1.3 million for labor fringe benefits (for health insurance, etc.). A component of this \$1.3 million is \$600,000 for life insurance for Jeans West’s executives. C.O. helped arrange this life insurance policy. It negotiated with the insurance company managing its own executive life insurance plans to include the Jeans West executives at rates much more favorable than those available in Caribe.

REQUIRED

1. What concerns should Roberts have about the revenue and cost numbers in C.O.’s financial reports?
2. Which (if any) of the concerns in requirement 1 raise ethical issues for Roberts? Explain.
3. What steps should Roberts take to address the ethical issues you identify in requirement 2?

COLLABORATIVE LEARNING PROBLEM

2-39 Defining cost terms. You are the controller of the Heinz potato processing subsidiary in Ireland. This subsidiary processes potatoes for frozen dinners, fast-food restaurants, and other large institutional buyers. Assume that companies setting up manufacturing facilities in Ireland receive an income tax rebate equivalent to the ratio of employment costs of Irish citizens to total manufacturing costs in Ireland. Thus, if the Irish subsidiary has a “pre-rebate” tax bill of \$10 million and the ratio of employment costs to total manufacturing costs is 22%, its actual tax bill will be reduced by \$2.2 million to \$7.8 million.

INSTRUCTIONS

Form groups of two or more students to complete the following requirement.

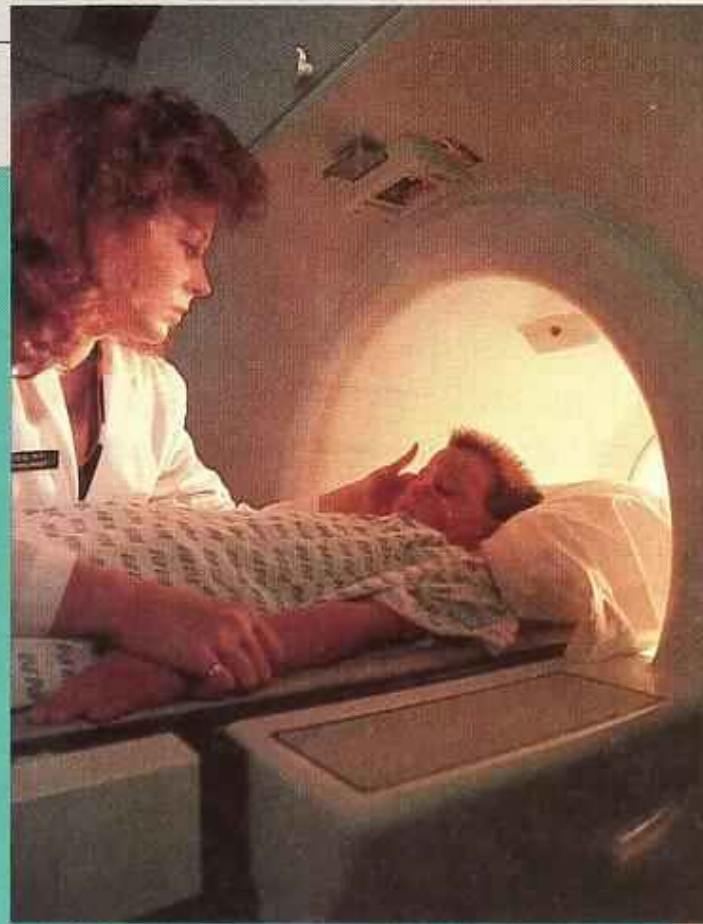
REQUIRED

Develop guidelines as to how Heinz should define costs at its Irish subsidiary. Assume one aim is to minimize the income taxes that Heinz is legitimately required to pay to the Irish government.

3

CHAPTER

COST-VOLUME-PROFIT RELATIONSHIPS



The growing complexity and sophistication of medical testing equipment is increasing the ratio of fixed costs to total costs in many hospitals. Magnetic resonance imaging (MRI) equipment enables hospitals to produce high quality images without exposing patients to ionizing radiation. Obtaining high utilization for this expensive equipment is essential for hospitals justifying investment in MRI technology.

LEARNING OBJECTIVES

After studying this chapter, you should be able to

1. Distinguish between the general case and a special case of CVP
2. Explain the relationship between operating income and net income
3. Describe the assumptions underlying CVP
4. Demonstrate three methods for determining the breakeven point and target operating income
5. Explain how sensitivity analysis can help managers cope with uncertainty
6. Illustrate how CVP can assist cost planning
7. Describe the effect of revenue mix on operating income
8. Illustrate how CVP can incorporate income taxes

Cost-volume-profit analysis provides a sweeping financial overview of the planning process. **Cost-volume-profit (CVP)** analysis examines the behavior of total revenues, total costs, and operating income as changes occur in the output level, selling price, variable costs, or fixed costs. Managers commonly use CVP as a tool to help them answer such questions as, How will revenues and costs be affected if we sell 1,000 more units? If we raise or lower our selling prices? If we expand business into overseas markets? These questions have a common “what-if” theme. CVP is built on simplifying assumptions about revenue and cost behavior patterns. This chapter examines CVP analysis and explains how the reasonableness underlying its assumptions affects the reliability of its results.

REVENUE DRIVERS AND COST DRIVERS: THE GENERAL CASE AND A SPECIAL CASE

OBJECTIVE 1

Distinguish between the general case and a special case of CVP

Revenues are inflows of assets received in exchange for products or services provided to customers. A **revenue driver** is a factor that affects revenues. Examples of revenue drivers are units of output sold, selling prices, and levels of marketing costs. Chapter 2 defined *cost* as a resource sacrificed or forgone to achieve a specific objective and a *cost driver* as any factor that affects cost—that is, a change in the cost driver will cause a change in the total cost of a related cost object. Examples of cost drivers include units of output manufactured, number of sales visits made, and number of packages shipped.

The most detailed way of predicting total revenues and total costs is to consider multiple revenue drivers and multiple cost drivers. We call this the general case. It can require extensive analysis and is likely to be very time-consuming. For now, we focus on a special case where we assume a single revenue driver and a single cost driver. That single driver is units of output (either output units sold or output units manufactured).

We focus on the special case of CVP relationships for two major reasons. First, many companies have found such relationships to be helpful in decisions relating to overall strategies and long-range plans and in decisions such as product and customer emphasis and pricing. Second, the straightforward relationships provide an excellent base for understanding the more complex relationships that exist with multiple revenues and multiple cost drivers:

General Case	Special Case
Many revenue drivers	Single revenue driver (output units)
Many cost drivers	Single cost driver (output units)
Various time spans for decisions (short run, long run, product life cycles)	Short-run decisions (time span, typically less than one year, in which fixed costs do not change within the relevant range)

The term *CVP analysis* is widely used as representing this special case. A single revenue driver and a single cost driver are used in this analysis. In the CVP model, volume (*V*) refers to units manufactured or units sold.

Our restriction to units of output as the sole revenue or cost driver is important to keep in mind. It means that in the CVP model, changes in the level of revenues and costs arise only because the output level changes. This restriction means that we will not consider a revenue driver such as the number of advertisements for a new product. Nor will we consider a cost driver such as the number of calls a customer makes for after-sales service or service repairs. These factors are examples of revenue or cost drivers that are not a function of units of output.

Keep in mind that our CVP restrictions considerably simplify real-world problems. Managers and accountants must always assess whether the simplified relationships of CVP generate sufficiently accurate predictions of how total revenues and total costs behave. Otherwise, they may be misled into making unwise decisions. In general, the simpler CVP model is preferable as long as management decisions would not be significantly improved using a more complicated decision model.

TERMINOLOGY AND ABBREVIATIONS

Before we can study CVP, we must understand its terminology. In this chapter, we assume total costs (also termed total expenses) are made up of only two categories: variable costs (variable with respect to units of output) and fixed costs.

$$\text{Total costs} = \text{Variable costs} + \text{Fixed costs}$$

Recall from Chapter 2 (Exhibit 2-5) that variable costs include both direct variable costs and indirect variable costs of a chosen cost object. Similarly, fixed costs include both direct fixed costs and indirect fixed costs of a chosen cost object.

Operating income is total revenues from operations minus total costs from operations (excluding income taxes):

$$\text{Operating income} = \text{Total revenues} - \text{Total costs}$$

Net income is operating income plus nonoperating revenues (such as interest revenue) minus nonoperating costs (such as interest cost) minus income taxes. For simplicity, throughout this chapter nonoperating revenues and nonoperating costs are assumed to be zero. Thus, net income will be computed as follows:

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

In the examples that follow, the measure of output is the number of units manufactured or units sold. Different industries often use different terminology to describe their measure of output. Examples include

Industry	Measure of Output
Airlines	Passenger-miles
Automobiles	Vehicles manufactured
Hospitals	Patient-days
Hotels/motels	Rooms occupied
Universities	Student credit-hours

The following abbreviations are used in this chapter:

- ◆ USP = Unit selling price
- ◆ UVC = Unit variable costs
- ◆ UCM = Unit contribution margin (USP – UVC)
- ◆ FC = Fixed costs
- ◆ Q = Quantity of output units sold (or manufactured)
- ◆ OI = Operating income
- ◆ TOI = Target operating income
- ◆ NI = Net income

OBJECTIVE 2

Explain the relationship between operating income and net income

CVP ASSUMPTIONS

The CVP analysis that we now discuss is based on the following assumptions:

1. Total costs can be divided into a fixed component and a component that is variable with respect to the level of output.
2. The behavior of total revenues and total costs is linear (straight-line) in relation to output units within the relevant range.¹

OBJECTIVE 3

Describe the assumptions underlying CVP

one unit of output, single product, single cost

¹For example, one set of conditions in which assumption 2 is descriptive includes the following: Selling prices are constant within the relevant range; productivity is constant; and costs of production inputs are constant within the relevant range. How might nonlinearity arise? On the revenue side, reductions in the selling price may be necessary to spur sales at higher levels of output. On the cost side, variable costs per unit may decline when output increases as employees learn to handle the process more efficiently. The learning curve is discussed in Chapter 10.

3. The unit selling price, unit variable costs, and fixed costs are known. (This assumption is discussed later in the chapter and in the appendix to this chapter.)
4. The analysis either covers a single product or assumes that a given revenue mix of products will remain constant as the level of total units sold changes. (This assumption is also discussed later in the chapter.)
5. All revenues and costs can be added and compared without taking into account the time value of money. (Chapters 22 and 23 relax this assumption.)

These CVP assumptions clearly are extreme in the sense that they would rarely match reality. Managers should always question whether a more complicated approach than CVP is warranted.

THE BREAK-EVEN POINT

OBJECTIVE 4

Demonstrate three methods for determining the breakeven point and target operating income

CVP analysis can be used to examine how various “what-if” alternatives being considered by a decision maker affect operating income. The breakeven point is frequently one point of interest in this analysis. Managers wish to avoid the stigma of making a loss. The **breakeven point** is that quantity of output where total revenues and total costs are equal, that is, where the operating income is zero.

Using the information in the following example, this section examines three methods for determining the breakeven point: the equation method, the contribution margin method, and the graph method.

EXAMPLE: Mary Frost plans to sell Do-All Software, a software package, at a heavily attended two-day computer convention in Chicago. Mary can purchase this software from a computer software wholesaler at \$120 per package with the privilege of returning all unsold units and receiving a full \$120 rebate per package. The units (packages) will be sold at \$200 each. Frost has already paid \$2,000 to Computer Conventions, Inc., for the booth rental for the two-day convention. What quantity of units will she need to sell in order to breakeven? Assume there are no other costs.

Equation Method

The first approach for computing the breakeven point is the equation method. Using the terminology in this chapter, the income statement can be expressed in equation form as follows:

$$\begin{aligned}\text{Revenues} - \text{Variable costs} - \text{Fixed costs} &= \text{Operating income} \\ (\text{USP} \times Q) - (\text{UVC} \times Q) - \text{FC} &= \text{OI}\end{aligned}$$

This equation provides the most general and easy-to-remember approach to any CVP situation. Setting operating income equal to zero in the preceding equation, we obtain

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

If Frost sells fewer than 25 units, she will have a loss; if she sells 25 units, she will breakeven; and if she sells more than 25 units, she will make a profit. This breakeven point is expressed in units. It can also be expressed in sales dollars: 25 units $\times$ \$200 selling price = \$5,000.

Contribution Margin Method

A second approach is the contribution margin method, which is simply an algebraic manipulation of the equation method. Contribution margin is equal to revenues minus all costs of the output (a product or service) that vary with respect to the units of output. This method uses the fact that

$$(\text{USP} \times Q) - (\text{UVC} \times Q) - \text{FC} = \text{OI}$$

$$(\text{USP} - \text{UVC}) \times Q = \text{FC} + \text{OI}$$

$$\text{UCM} \times Q = \text{FC} + \text{OI}$$

$$Q = \frac{\text{FC} + \text{OI}}{\text{UCM}}$$

At the breakeven point, operating income is, by definition, zero. Setting $\text{OI} = 0$, we obtain

$$\begin{aligned} \text{Breakeven number of units} &= \frac{\text{Fixed costs}}{\text{Unit contribution margin}} \\ &= \frac{\text{FC}}{\text{UCM}} \end{aligned}$$

The calculations in the equation method and the contribution margin method appear similar because one is merely a restatement of the other. In our example, fixed costs are \$2,000 and the unit contribution margin is \$80 (\$200 - \$120). Therefore,

$$\text{Breakeven number of units} = \$2,000 \div \$80 = 25 \text{ units}$$

A **contribution income statement** groups line items by cost behavior pattern to highlight the contribution margin. The following such statement confirms the preceding breakeven calculations:

Revenues, $\$200 \times 25$	\$5,000
Variable costs, $\$120 \times 25$	<u>3,000</u>
Contribution margin, $\$80 \times 25$	2,000
Fixed costs	<u>2,000</u>
Operating income	<u>\$ 0</u>

Graph Method

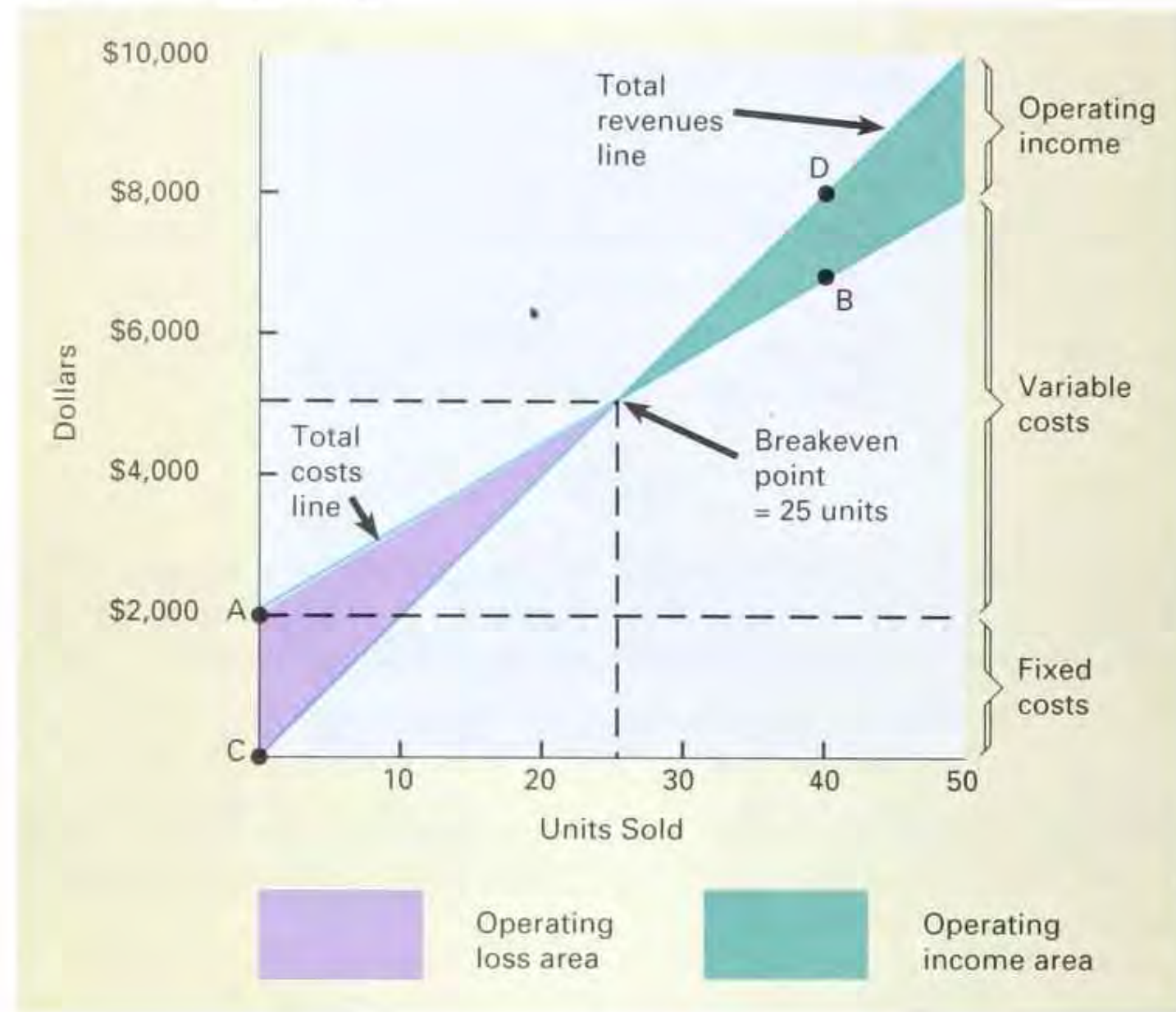
In the graph method, we plot the total costs line and the total revenues line. Their point of intersection is the breakeven point. Exhibit 3-1 illustrates this method for our Do-All example. We need only two points to plot each line if each is assumed to be linear:

1. *Total costs line.* This line is the sum of the fixed costs and the variable costs. Fixed costs are \$2,000 at all output levels within the relevant range. To plot fixed costs, measure \$2,000 on the vertical axis (point *A*) and extend a line horizontally. Variable costs are \$120 per unit. To plot the total costs line, use as one point the \$2,000 fixed costs at 0 output units (point *A*). Select a second point by choosing any other convenient output level (say, 40 units) and determining the corresponding total costs. The total variable costs at this output level are \$4,800 ($40 \times \120). Fixed costs are \$2,000 at all output levels within the relevant range. Hence, total costs at 40 units of output are \$6,800, which is point *B* in Exhibit 3-1. The total costs line is the straight line from point *A* passing through point *B*.

2. *Total revenues line.* One convenient starting point is zero revenues at the zero output level, which is point *C* in Exhibit 3-1. Select a second point by choosing any other convenient output level and determining its total revenues. At 40 units of output, total revenues are \$8,000 ($40 \times \200), which is point *D* in Exhibit 3-1. The total revenues line is the straight line from point *C* passing through point *D*.

The breakeven point is where the total revenues line and the total costs line intersect. At this point, total revenues equal total costs. But Exhibit 3-1 shows the profit or loss outlook for a wide range of output levels. Many people describe the topics covered in this chapter as break-even analysis. We prefer to use the phrase cost-volume-profit analysis to avoid overemphasizing the single point where total revenues equal total costs. Managers want to know how operating income differs at many different output levels.

EXHIBIT 3-1
Cost-Volume-Profit Graph



Target Operating Income

Let us introduce a profit element by asking, How many units must be sold to earn an operating income of \$1,200? The equation method provides a straightforward way to answer this question:

Let QT = Number of units sold to earn target operating income

Revenues – Variable costs – Fixed costs = Target operating income

$$\$200QT - \$120QT - \$2,000 = \$1,200$$

$$\$80QT = \$2,000 + \$1,200$$

$$\$80QT = \$3,200$$

$$QT = \$3,200 \div \$80 = 40 \text{ units}$$

Alternatively, we could use the contribution margin method. The numerator now consists of fixed costs plus target operating income:

$$QT = \frac{\text{Fixed costs} + \text{Target operating income}}{\text{Unit contribution margin}} = \frac{FC + TOI}{UCM}$$

$$QT = \frac{\$2,000 + \$1,200}{\$80}$$

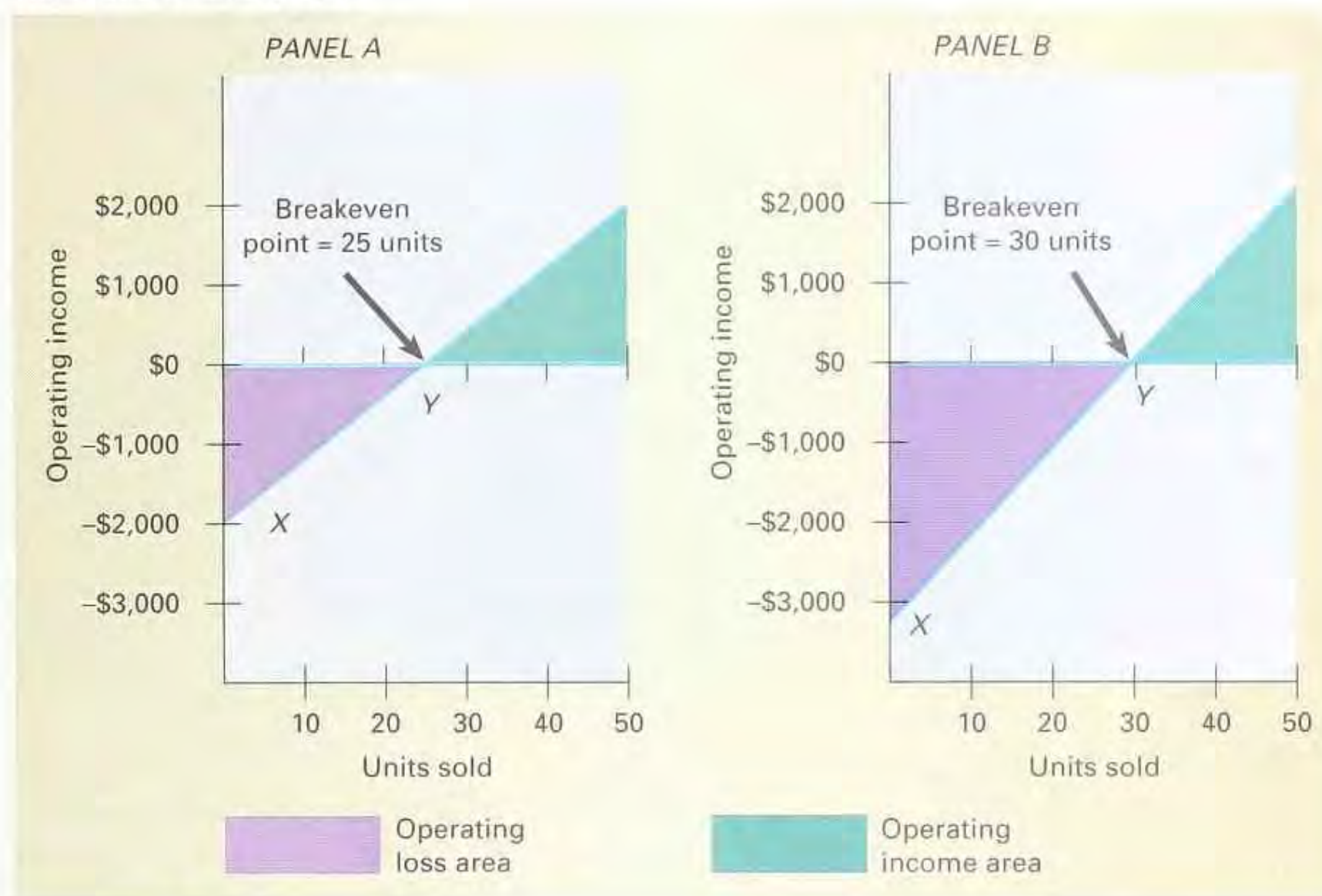
$$\$80QT = \$3,200$$

$$QT = \$3,200 \div \$80 = 40 \text{ units}$$

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

The graph in Exhibit 3-1 indicates that at the 40-unit output level, the difference between total revenues and total costs is the \$1,200 operating income.

EXHIBIT 3-2
The Profit-Volume Graph



THE PV GRAPH

We can recast Exhibit 3-1 in the form of a profit-volume (PV) graph. A **PV graph** shows the impact on operating income of changes in the output level. Exhibit 3-2 (Panel A) presents the PV graph for Do-All (fixed costs of \$2,000, selling price of \$200, and variable costs per unit of \$120). The PV line can be drawn using two points. One convenient point (X) is the level of fixed costs at zero output—\$2,000, which is also the operating loss at this output level. A second convenient point (Y) is the breakeven point—25 units in our example (see p. 65). The PV line is drawn by connecting points X and Y and extending the line beyond Y. Each unit sold beyond the breakeven point will add \$80 to operating income. At the 35-unit output level, for example, operating income would be \$800:

$$(\$200 \times 35) - (\$120 \times 35) - \$2,000 = \$800$$

A comparison of PV charts representing different what-if possibilities can highlight their effects on operating income. Panel B in Exhibit 3-2 shows the PV chart for Do-All assuming fixed costs of \$3,300 (compared with \$2,000 in Panel A) and variable costs per unit of \$90 (compared with \$120 in Panel A). The selling price is \$200 in both graphs. The unit contribution margin in Panel B is \$110. The breakeven point in Panel B is 30 units:

$$\$200Q - \$90Q - \$3,300 = 0$$

$$Q = \$3,300 \div \$110 = 30 \text{ units}$$

Each unit sold beyond the breakeven point will add \$110 to operating income. The PV graph in Panel B has a steeper slope for its operating income line, which means that the operating income increases at a faster rate as the level of output increases.

SENSITIVITY ANALYSIS AND UNCERTAINTY

Sensitivity analysis is a what-if technique that examines how a result will change if the original predicted data are not achieved or if an underlying assumption changes. In the context of CVP, sensitivity analysis answers such questions as, What will operating income be if the output level decreases by 5% from the original prediction?

EXHIBIT 3-3
Spreadsheet Analysis of CVP Relationships for Do-All Software

Fixed Costs	Variable Costs per Unit	Revenue Dollars Required at \$200 Selling Price to Earn Operating Income of			
		\$0	\$1,000	\$1,500	\$2,000
\$2,000	\$100	\$ 4,000	\$ 6,000	\$ 7,000	\$ 8,000
	120	5,000	7,500	8,750	10,000
	140	6,667	10,000	11,667	13,333
\$2,500	\$100	\$ 5,000	\$ 7,000	\$ 8,000	\$ 9,000
	120	6,250	8,750	10,000	11,250
	140	8,333	11,667	13,333	15,000
\$3,000	\$100	\$ 6,000	\$ 8,000	\$ 9,000	\$10,000
	120	7,500	10,000	11,250	12,500
	140	10,000	13,333	15,000	16,667

and What will operating income be if variable costs per unit increase by 10%? The sensitivity to various possible outcomes broadens managers' perspectives as to what might actually occur despite their well-laid plans.

The widespread use of electronic spreadsheets has promoted the use of CVP analysis in many organizations. Using spreadsheets, managers can easily conduct CVP-based sensitivity analyses to examine the effect and interaction of changes in selling prices, unit variable costs, fixed costs, and target operating incomes. Exhibit 3-3 displays a spreadsheet for our Do-All example. Mary Frost can immediately see the revenues that need to be generated to reach particular operating income levels, given alternative levels of fixed costs and variable costs per unit. For example, revenues of \$6,000 (30 units at \$200 per unit) are required to earn an operating income of \$1,000 if fixed costs are \$2,000 and variable costs per unit are \$100. Frost can also use Exhibit 3-3 to assess whether she wants to sell at the Chicago computer convention if, for example, the booth rental is raised to \$3,000 (thus increasing fixed costs to \$3,000) or the software supplier raises its price to \$140 per unit (thus increasing variable costs to \$140 per unit).

One aspect of sensitivity analysis is the **margin of safety**, which is the excess of budgeted revenues over the breakeven revenues. The margin of safety is the answer to the what-if question: If budgeted revenues are above breakeven and drop, how far can they fall below budget before the breakeven point is reached? Such a fall could be due to a competitor having a better product, poorly executed marketing, and so on. Assume that Mary Frost has fixed costs of \$3,000, a selling price of \$200, and variable costs per unit of \$140. For 75 units sold, the budgeted revenues are \$15,000 and the budgeted operating income is \$1,500. The breakeven point for this set of assumptions is 50 units ($\$3,000 \div \60) or \$10,000 ($\200×50). Hence, the margin of safety is \$5,000 ($\$15,000 - \$10,000$) or 25 units.

Sensitivity analysis is one approach to recognizing **uncertainty**, which is defined here as the possibility that an actual amount will deviate from an expected amount. Another approach is to compute expected values using probability distributions. The appendix to this chapter illustrates this approach.

OBJECTIVE 5

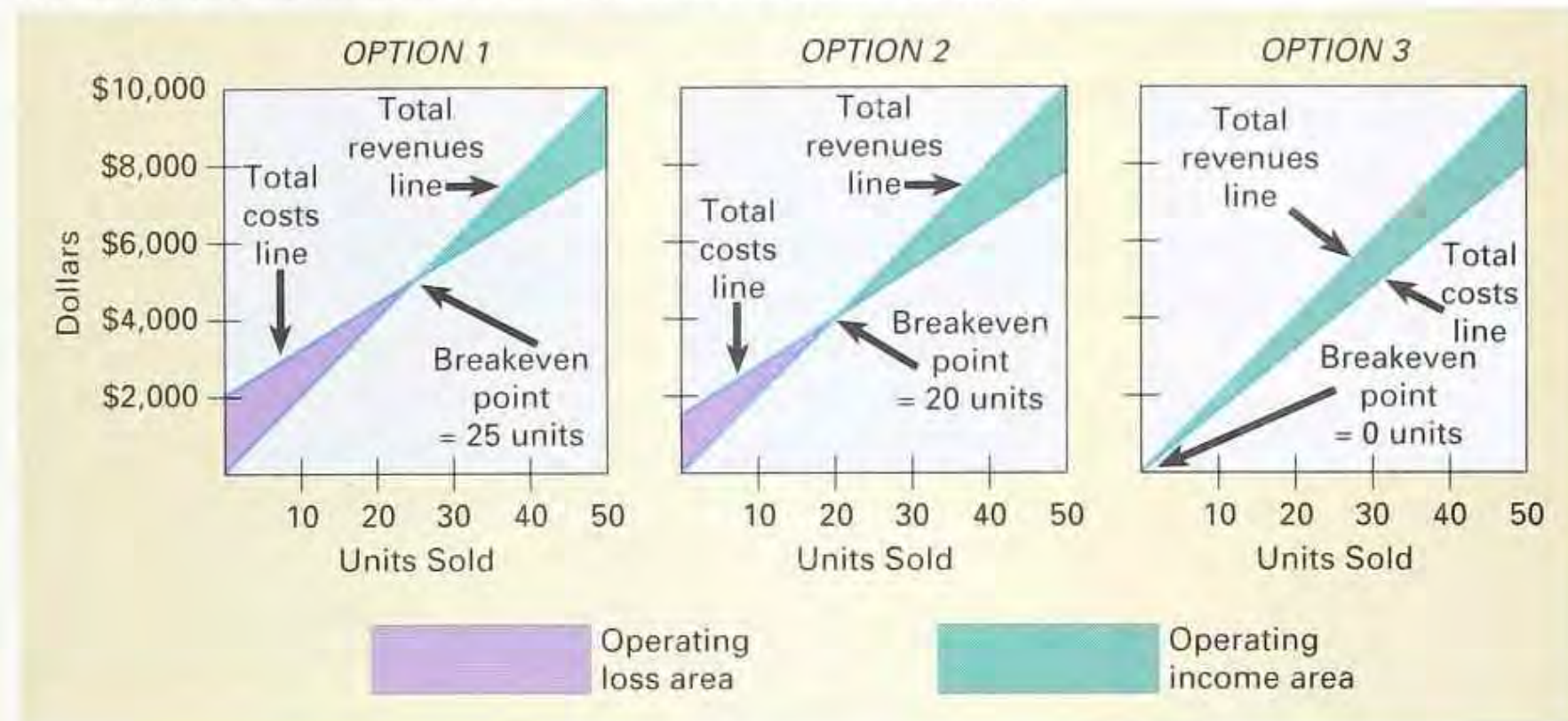
Explain how sensitivity analysis can help managers cope with uncertainty

COST PLANNING AND CVP

Alternative Fixed-Cost/Variable-Cost Structures

Sensitivity analysis highlights the risks that an existing cost structure poses for an organization. This may lead managers to consider alternative cost structures. CVP helps managers in this task. Consider again Mary Frost and her booth rental agree-

EXHIBIT 3-4
CVP Graphs for Alternative Rental Schedules for Do-All Software



ment with Computer Conventions, Inc. Our original example has Frost paying a \$2,000 booth rental fee. Suppose, however, Computer Conventions offers Frost three rental alternatives:

- ◆ *Option 1:* \$2,000 fixed fee
- ◆ *Option 2:* \$1,400 fixed fee plus 5% of the convention revenues from Do-All sales
- ◆ *Option 3:* 20% of the convention revenues from Do-All sales with no fixed fee

Frost is interested in how her choice of a rental agreement will affect the risks she faces. Exhibit 3-4 presents these options in the CVP format:

- ◆ *Option 1* exposes her to fixed costs of \$2,000 and a breakeven point of 25 units. This option brings \$80 additional operating income for each unit sold above 25 units.
- ◆ *Option 2* exposes her to lower fixed costs of \$1,400 and a lower breakeven point of 20 units. There is, however, only \$70 in additional operating income for each unit sold above 20 units.
- ◆ *Option 3* has no fixed costs. Frost makes \$40 in additional operating income for each unit sold. This \$40 addition to operating income starts from the first unit sold. This option enables Frost to break even if no units are sold.²

CVP analysis highlights the different risks and different returns associated with each option. For example, while option 1 has the most downside risk (a \$2,000 fixed up-front payment), it also has the highest contribution margin per unit. This \$80 contribution margin per unit translates to high upside potential if Frost is able to generate sales above 25 units. By moving from option 1 to option 2, Frost faces less risk (lowers her fixed costs) if demand is low, but she must accept less upside potential (because of the higher variable costs) if demand is high. The choice among options 1, 2, and 3 will be influenced by her confidence in the level of demand for Do-All software and her willingness to risk money.

²The break-even point of 25 units for option 1 was computed earlier in this chapter. The break-even point (Q) for option 2 is calculated as follows:

$$\begin{aligned}\text{Fixed costs} &= \$1,400 \\ \text{Unit variable costs} &= \$120 + 0.05(\$200) = \$130 \\ \text{Unit contribution margin} &= \$200 - \$130 = \$70 \text{ per unit} \\ \$200Q - \$130Q - \$1,400 &= 0 \\ Q &= \$1,400 \div \$70 = 20 \text{ units}\end{aligned}$$

Option 3 has a break-even point of zero units because there are no fixed costs. The variable costs per unit are \$160 (\$120 + 0.20[\$200]). The contribution margin per unit is \$40 (\$200 - \$160).

OBJECTIVE 6

Illustrate how CVP can assist cost planning

How a Jobs-Bank Agreement Increased GM's Breakeven Point

The breakeven point of an automotive company is greatly affected by the behavior of manufacturing labor costs. Where manufacturing labor is a fixed cost, the breakeven point will be higher than where it is a variable cost. A 1990 contract between General Motors Corporation (GM) and the United Auto Workers (UAW) resulted in manufacturing labor cost behaving more like a fixed cost than as a variable cost when the level of production declined. In this contract, GM guaranteed \$3.3 billion for worker jobs and income guarantees over three years. Provisions of the contract include:

- ◆ In the first 36 weeks of a layoff, workers receive unemployment insurance and supplemental insurance benefits equal to 95% of take-home pay.
- ◆ After the 36 weeks of layoff, workers go back on full pay and benefits, either at their old plant or as part of a jobs bank.

This contract was designed, in part, to motivate GM employees to seek new ways to continuously improve quality and reduce costs without their own employment being at risk.

When GM's production output declined in the early 1990s, many workers joined the jobs bank. GM has sought ways to use them productively. One proposal was to have their independent supplier companies use GM workers and facilities when manufacturing parts for GM. This proposal was labeled a "strategic in-sourcing initiative." One commentator noted at the time that the plan met resistance from suppliers who were none too anxious to move into GM's unwanted plants and use GM's highly paid workers.

The result was that GM still had an excessive number of underutilized people who were receiving full pay and benefits. This led to GM having a higher breakeven point than several of its competitors who did not have similar jobs-bank agreements.

Source: Adapted from *The Detroit News* (December 12, 1991) and *Automotive News* (February 1, 1993).



Effect of Time Horizon

A critical assumption of CVP analysis is that costs can be classified as either variable or fixed. This classification can be affected by the time period being considered. The shorter the time horizon we consider, the higher the percentage of total costs we may view as fixed. Consider United Airlines. Suppose a United Airlines plane will depart from its gate in 30 minutes and there are 20 empty seats. A potential passenger arrives bearing a transferable ticket from a competing airline. What are the variable costs to United of placing one more passenger in an otherwise empty seat? Variable costs (such as one more meal) would be negligible. Virtually all the costs in that decision situation are fixed. In contrast, suppose United must decide whether to include another city in its routes. This decision may have a one-year planning horizon. Many more costs would be regarded as variable and fewer as fixed in this decision.

This example underscores the importance of how the time horizon of a decision affects the analysis of cost behavior. In brief, whether costs are really fixed depends heavily on the relevant range, the length of the time horizon in question, and the specific decision situation.

EFFECTS OF REVENUE MIX ON INCOME

Revenue mix (also called **sales mix**) is the relative combination of quantities of products or services that constitutes total revenues. If the mix changes, overall revenue targets may still be achieved. However, the effects on operating income depend on how the original proportions of lower or higher contribution margin products have shifted.

Suppose Mary Frost in our computer convention example is now budgeting for the next convention. She plans to sell two software products—Do-All and Superword—and budgets the following:

OBJECTIVE 7

Describe the effect of revenue mix on operating income

	Do-All	Superword	Total
Units sold	60	30	90
Revenues, \$200 and \$130 per unit	\$12,000	\$ 3,900	\$15,900
Variable costs, \$120 and \$90 per unit	7,200	2,700	9,900
Contribution margin, \$80 and \$40 per unit	<u>\$ 4,800</u>	<u>\$ 1,200</u>	<u>6,000</u>
Fixed costs			2,000
Operating income			<u>\$ 4,000</u>

What is the breakeven point? Unlike the single product (or service) situation, there is not a unique number of units for a multiple-product situation. This number instead depends on the revenue mix. The following approach can be used when it is assumed that the budgeted revenue mix (2 units of Do-All sold for each unit of Superword sold) will not change at different levels of total revenue:

Let S = Number of units of Superword to break even

$2S$ = Number of units of Do-All to break even

Revenues – Variable costs – Fixed costs = Operating income

$$[\$200(2S) + \$130S] - [\$120(2S) + \$90S] - \$2,000 = 0$$

$$\$530S - \$330S = \$2,000$$

$$\$200S = \$2,000$$

$$S = 10$$

$$2S = 20$$

The breakeven point is 30 units when the revenue mix is 20 units of Do-All and 10 units of Superword. The total contribution margin of \$2,000 (Do-All $\$80 \times 20 = \$1,600$ plus Superword $\$40 \times 10 = \400) equals the fixed costs of \$2,000 at this mix.

Alternative revenue mixes (in units) that have a contribution margin of \$2,000 and thus result in breakeven operations include the following:

Do-All	25	20	15	10	5	0
Superword	0	10	20	30	40	50
Total	25	30	35	40	45	50

Other things being equal, for any given total quantity of units sold, if the mix shifts toward units with higher contribution margins, operating income will be higher. Thus, if the mix shifts toward Do-All (say, to 70% Do-All from 60% Do-All) with a contribution margin of twice that of Superword, Frost's operating income will increase.

Despite their desire to maximize revenues from all products, managers must frequently cope with limited (constrained) resources. For instance, additional production capacity may be unavailable. Which products should be produced? As Chapter 11 explains in more detail, the best decision is not necessarily to make the product having the highest contribution margin per unit. Rather, the best decision recognizes the contribution margin per unit of the constraining factor.

ROLE OF INCOME TAXES

OBJECTIVE 8

Illustrate how CVP can incorporate income taxes

When we introduced a target operating income in our earlier Do-All software example, the following income statement was shown (p. 64):

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

The net income of Do-All is operating income minus income taxes. What number of units must Do-All sell to earn a net income of \$1,200, assuming operating income is taxed at a rate of 40%? The only change in the equation method of CVP analysis is to modify the target operating income to allow for income taxes. Recall our previous equation method:

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

We now introduce income tax effects:

$$\text{Target net income} = (\text{Operating income}) - [(\text{Operating income}) \times (\text{Tax rate})]$$

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

$$\text{Operating income} = \frac{\text{Target net income}}{1 - \text{Tax rate}}$$

So, taking income taxes into account, the equation method yields:

$$\text{Revenues} - \text{Variable costs} - \text{Fixed costs} = \frac{\text{Target net income}}{1 - \text{Tax rate}}$$

Substituting numbers from our Do-All example, the equation would now be:

$$\$200Q - \$120Q - \$2,000 = \frac{\text{Target net income}}{1 - \text{Tax rate}}$$

$$\$200Q - \$120Q - \$2,000 = \frac{\$1,200}{1 - 0.40}$$

$$\$200Q - \$120Q - \$2,000 = \$2,000$$

$$\$80Q = \$4,000$$

$$Q = \$4,000 \div \$80 = 50 \text{ units}$$

Proof:	Revenues, $\$200 \times 50$	\$10,000
	Variable costs, $\$120 \times 50$	6,000
	Contribution margin	4,000
	Fixed costs	2,000
	Operating income	2,000
	Income taxes, $\$2,000 \times 0.40$	800
	Net income	<u>\$ 1,200</u>

Suppose the target net income were set at \$1,680 instead of \$1,200. The required number of unit sales would rise from 50 to 60 units:

$$\text{Operating income} = \frac{\text{Target net income}}{1 - \text{Tax rate}}$$

$$\$200Q - \$120Q - \$2,000 = \frac{\$1,680}{1 - 0.40}$$

$$\$80Q - \$2,000 = \$2,800$$

$$\$80Q = \$4,800$$

$$Q = \$4,800 \div \$80 = 60 \text{ units}$$

The presence of income taxes will not change the breakeven point. Why? Because, by definition, operating income at the breakeven point is zero, and thus no income taxes will be paid.³

NONPROFIT INSTITUTIONS AND CVP

CVP can be readily applied to decisions by both nonprofit and for-profit organizations. Suppose a social welfare agency has a government budget appropriation (revenue) for 19_7 of \$900,000. This nonprofit agency's major purpose is to assist handicapped people who are seeking employment. On average, the agency supplements each person's income by \$5,000 annually. The agency's fixed costs are \$270,000. There are no other costs. The agency manager wants to know how many people could be assisted in 19_7. We can use CVP analysis here by assuming zero operating income. Let Q be the number of people to be assisted:

$$\text{Revenue} - \text{Variable costs} - \text{Fixed costs} = \$0$$

$$\$900,000 - \$5,000Q - \$270,000 = \$0$$

$$\$5,000Q = \$900,000 - \$270,000$$

$$Q = \$630,000 \div \$5,000 = 126 \text{ people}$$

Suppose the manager is concerned that the total budget appropriation for 19_7 will be reduced by 15% to a new amount of $(1 - 0.15) \times \$900,000 = \$765,000$. The manager wants to know how many handicapped people will be assisted. Assume the same amount of monetary assistance per person:

$$\$765,000 - \$5,000Q - \$270,000 = \$0$$

$$\$5,000Q = \$765,000 - \$270,000$$

$$Q = \$495,000 \div \$5,000 = 99 \text{ people}$$

Note the following two characteristics of the CVP relationships in this nonprofit situation:

1. The percentage drop in service, $(126 - 99) \div 126$, or 21.4%, is more than the 15% reduction in the budget appropriation. Why? Because the existence of \$270,000 in fixed costs means that the percentage drop in service exceeds the percentage drop in budget appropriation.
2. If the relationships were graphed, the budget appropriation (revenue) amount would be a straight horizontal line of \$765,000. The manager could adjust operations to stay within the reduced appropriation in one or more of three major ways: (a) Reduce the number of people assisted; (b) reduce the variable costs (the assistance per person); or (c) reduce the total fixed costs.

CONTRIBUTION MARGIN AND GROSS MARGIN

Contribution margin is a key concept in this chapter. We now consider how it is related to the gross margin concept discussed in Chapter 2. First some definitions:

$$\text{Contribution margin} = \text{Revenues} - \frac{\text{All costs that vary with respect to number of output units}}{\text{number of output units}}$$

$$\text{Gross margin} = \text{Revenues} - \text{Cost of goods sold}$$

The phrase "all costs that vary" refers to variable costs in each of the business functions of the value chain. Cost of goods sold in the merchandising sector is made up of goods purchased for resale. Cost of goods sold in the manufacturing sector consists entirely of manufacturing costs (including fixed manufacturing costs).

³Other types of taxes may affect the breakeven point. For example, a sales tax paid by the seller that is a fixed percentage of revenues can be treated as a variable cost and hence will increase the breakeven point.

Service-sector companies can compute a contribution margin figure but not a gross margin figure. Service-sector companies do not have a cost of goods sold line item in their income statement.

Merchandising Sector

The two areas of difference between contribution margin and gross margin for companies in the merchandising sector are fixed cost of goods sold (such as a fixed annual payment to a supplier to guarantee an exclusive option to purchase merchandise) and variable noncost of goods sold items (such as a salesperson's commission that is a percentage of sales dollars). Contribution margin is computed after all variable costs have been deducted, whereas gross margin is computed by deducting only cost of goods sold from revenues. The following example (figures assumed to be in thousands) illustrates this difference:

Contribution Margin Format			Gross Margin Format	
Revenues		\$200	Revenues	\$200
Variable cost of goods sold	\$120		Cost of goods sold (\$120 + \$5)	<u>125</u>
Other variable costs	<u>43</u>	<u>163</u>	Gross margin	75
Contribution margin		37	Operating costs (\$43 + \$19)	<u>62</u>
Fixed costs of goods sold	5		Operating income	<u>\$ 13</u>
Other fixed costs	<u>19</u>	<u>24</u>		
Operating income		<u>\$ 13</u>		

Fixed cost of goods sold for a merchandiser include only fixed costs directly related to the purchase of merchandise. The preceding example is a fixed annual payment to a supplier of merchandise. It would not include fixed costs (such as fixed salaries) of the purchasing department. These costs would be included in other fixed costs in the contribution margin format.

Manufacturing Sector

The two areas of difference between contribution margin and gross margin for companies in the manufacturing sector are fixed manufacturing costs and variable nonmanufacturing costs. The following example (figures assumed to be in thousands) illustrates this difference:

Revenues		\$1,000	Revenues	\$1,000
Variable manufacturing costs	\$250		Cost of goods sold (\$250 + \$160)	<u>410</u>
Variable nonmanufacturing costs	<u>270</u>	<u>520</u>	Gross margin	590
Contribution margin		480	Nonmanufacturing costs (\$270 + \$138)	<u>408</u>
Fixed manufacturing costs	160		Operating income	<u>\$ 182</u>
Fixed nonmanufacturing costs	<u>138</u>	<u>298</u>		
Operating income		<u>\$ 182</u>		

Fixed manufacturing costs are not deducted from revenues when computing contribution margin but are deducted when computing gross margin. Cost of goods sold in a manufacturing company includes entirely manufacturing costs. Variable nonmanufacturing costs are deducted from revenues when computing contribution margins but are not deducted when computing gross margins.

Both the *contribution margin* and the *gross margin* can be expressed as totals, as an amount per unit, or as percentages. The **contribution margin percentage** is the total contribution margin divided by revenues. The **variable-cost percentage** is the total variable costs (with respect to units of output) divided by revenues. The contribution margin percentage in our manufacturing-sector example is 48% ($\$480 \div \$1,000$), while the variable-cost percentage is 52% ($\$520 \div \$1,000$). The **gross margin percentage** is the gross margin divided by revenues—59% ($\$590 \div \$1,000$) in our manufacturing-sector example.

Wembley Travel is a travel agency specializing in flights between Los Angeles and London. It books passengers on United Airlines. United charges passengers \$900 per round-trip ticket. Until last month, United paid Wembley a commission of 10% of the ticket price paid by each passenger. This was Wembley's only source of revenues. Wembley's fixed costs are \$14,000 per month (for salaries, rent, etc.), and its variable costs are \$20 per ticket purchased for a passenger. This \$20 includes a \$15 per ticket delivery fee paid to Federal Express. (To keep the analysis simple, we assume each round-trip ticket purchased is delivered in a separate package; thus the \$15 delivery fee applies to every ticket.)

United Airlines has just announced a revised payment schedule for travel agents. It will now pay travel agents a 10% commission per ticket up to a maximum of \$50. Any ticket costing more than \$500 receives only a \$50 commission, irrespective of the ticket price.

REQUIRED

- Under the old 10% commission structure, how many round-trip tickets must Wembley sell each month to (a) breakeven, and (b) earn an operating income of \$7,000 per month?
- How does United's revised payment schedule affect your answers to (a) and (b) in requirement 1?
- Wembley is approached by DHL Express, who offers to charge \$9 per ticket delivered. How would accepting this offer affect your answers to (a) and (b) in requirement 2? (Assume the maximum commission is \$50 per ticket.) DHL Express offers next-day service, with reliability comparable to Federal Express.

SOLUTION

- Wembley receives a 10% commission on each ticket— $10\% \times \$900 = \90 . Thus,

$$USP = \$90$$

$$UVC = \$20$$

$$UCM = \$90 - \$20 = \$70$$

$$FC = \$14,000 \text{ per month}$$

$$\text{a. } Q = \frac{FC}{UCM} = \frac{\$14,000}{\$70} = 200 \text{ tickets per month}$$

- When target operating income (TOI) = \$7,000 per month:

$$\begin{aligned} QT &= \frac{FC + TOI}{UCM} \\ &= \frac{\$14,000 + \$7,000}{\$70} = \frac{\$21,000}{\$70} \\ &= 300 \text{ tickets per month} \end{aligned}$$

- Wembley receives only \$50 on the \$900 ticket because it exceeds \$500. Thus,

$$USP = \$50$$

$$UVC = \$20$$

$$UCM = \$50 - \$20 = \$30$$

$$FC = \$14,000 \text{ per month}$$

$$\text{a. } Q = \frac{\$14,000}{\$30} = 467 \text{ tickets (rounded up)}$$

$$\text{b. } QT = \frac{\$21,000}{\$30} = 700 \text{ tickets}$$

The \$50 cap on the commission paid per ticket causes the breakeven point to more than double (from 200 to 467) and the tickets sold to yield \$7,000 per month to also more than double (from 300 to 700). Not surprisingly, travel agents reacted very negatively to the United Airlines proposal to change commission payments.

3. The DHL Express offer reduces the variable cost per ticket from \$20 to \$14 (reflecting the drop in carrier costs from \$15 to \$9).

$$USP = \$50$$

$$UVC = \$14$$

$$UCM = \$50 - \$14 = \$36$$

$$FC = \$14,000 \text{ per month}$$

$$\text{a. } Q = \frac{\$14,000}{\$36} = 389 \text{ tickets (rounded up)}$$

$$\text{b. } QT = \frac{\$21,000}{\$36} = 584 \text{ tickets (rounded up)}$$

The increase in contribution margin decreases both the breakeven point and the number of tickets required to yield the \$7,000 target operating income.

SUMMARY

The following points are linked to the chapter's learning objectives.

1. General profit planning in its full complexity assumes that there are many revenue drivers and many cost drivers. CVP is a special case that, in a restricted number of settings, can assist managers in understanding the behavior of total costs, total revenues, and operating income as changes occur in the output level, selling price, variable costs, or fixed costs.
2. Operating income is computed by subtracting operating costs from operating revenues. Net income is operating income plus nonoperating revenues minus nonoperating costs minus income taxes.
3. Using CVP requires simplifying assumptions, including that costs are either fixed or variable with respect to the number of output units (units manufactured or units sold) and that total sales and total cost relationships are linear.
4. The three methods outlined for computing the breakeven point—the equation method, the contribution margin method, and the graph method—are merely re-statements of each other. Managers often select the method they find easiest to use in their specific situation.
5. Sensitivity analysis, a “what-if” technique, can systematically examine the effect on operating income and net income of different levels of fixed costs, variable costs per unit, selling prices, and output.
6. CVP can highlight to managers the downside risk and upside potential reward of alternatives that differ in their fixed costs and variable costs.
7. When CVP is applied to a multiple-product firm, it is assumed that there is a constant sales mix of products as the total quantity of units sold changes.
8. Income taxes can be incorporated into CVP analysis in a straightforward way by adjusting operating income by the income tax rate. The breakeven point is unaffected by the presence of income taxes because no income taxes are paid if there is no operating income.

APPENDIX: DECISION MODELS AND UNCERTAINTY

Managers make predictions and decisions in a world of uncertainty. This appendix explores the characteristics of uncertainty and describes how managers can cope with it. We also illustrate the additional insights gained when uncertainty is recognized in CVP analysis.

Coping with Uncertainty

Role of a Decision Model *Uncertainty* is the possibility that an actual amount will deviate from an expected amount. For example, marketing costs might be forecast at \$400,000 but actually turn out to be \$430,000. A **decision model** helps managers deal with uncertainty; it is a formal method for making a choice that often involves quantitative analysis. It usually includes the following elements:

1. A **choice criterion**, which is an objective that can be quantified. This objective can take many forms. Most often the choice criterion is expressed as a maximization of income or a minimization of cost. The choice criterion provides a basis for choosing the best alternative action.
2. A set of the alternative actions being considered.
3. A set of all the relevant **events** that may occur, where an event is a possible occurrence. This set of events should be mutually exclusive and collectively exhaustive. Events are mutually exclusive if they cannot occur at the same time. Events are collectively exhaustive if, taken together, they make up the entire set of possible occurrences (and no other event can occur). Examples are growth or no growth in industry demand and increase, decrease, or no change in interest rates. Only one event in a set of mutually exclusive and collectively exhaustive events will actually occur.
4. A set of probabilities, where a **probability** is the likelihood or chance of occurrence of an event.
5. A set of possible **outcomes** that measures, in terms of the choice criterion, the predicted consequences of the various possible combinations of actions and events.

It is important to distinguish actions from events. Actions are choices made by management—for example, the prices it should charge for the company's products. Events are occurrences that management cannot control—for example, a growing or declining economy. The outcome is the operating income the company makes, which depends both on the action management selects (pricing strategy) and the event that occurs (how the economy performs). Exhibit 3-5 presents an overview of a decision model, the implementation of the chosen action, its outcome, and subsequent performance evaluation.

EXHIBIT 3-5

A Decision Model and Its Link to Performance Evaluation

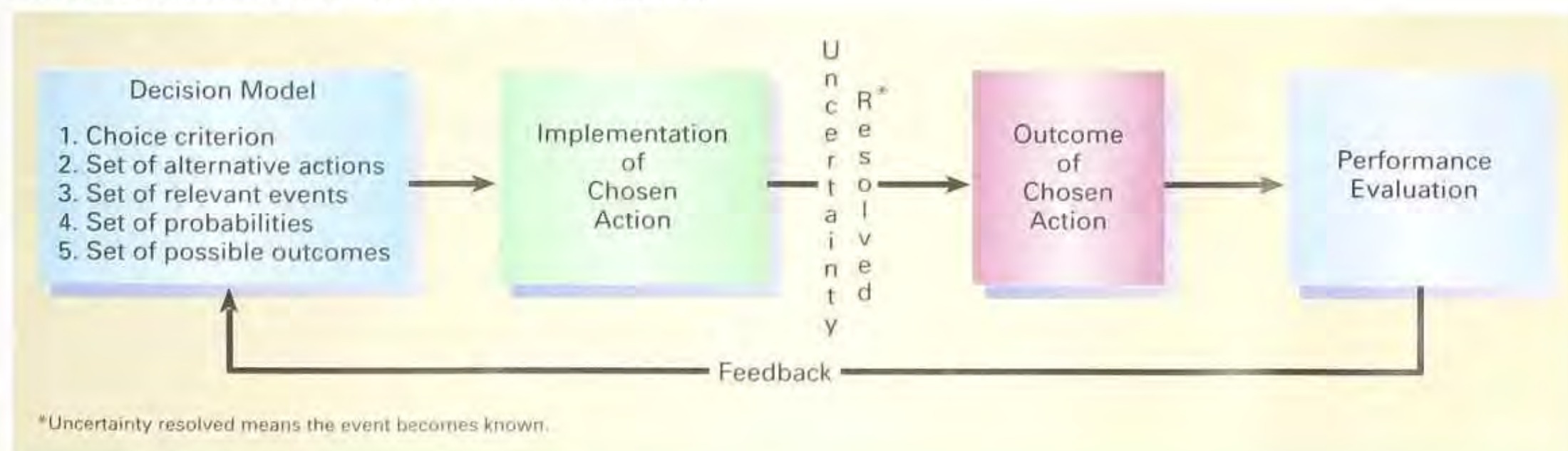
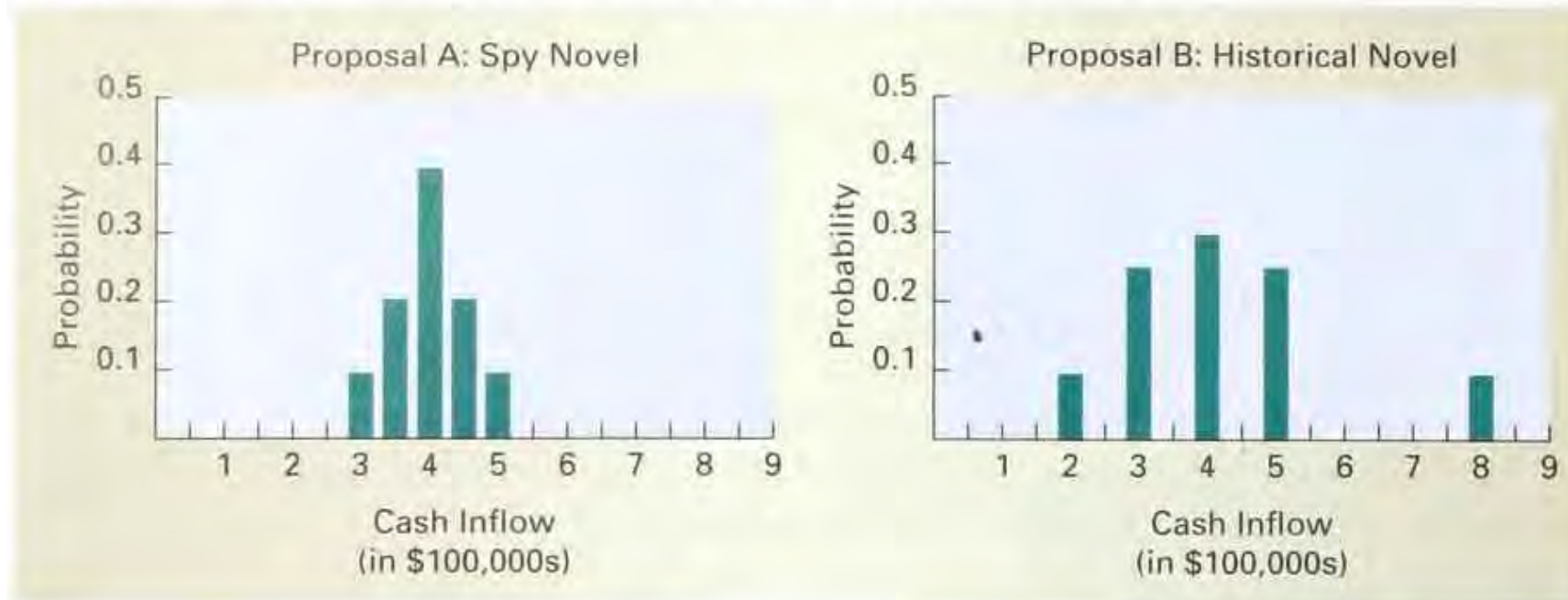


EXHIBIT 3-6

Decisions under Uncertainty: Comparison of Probability Distributions



Probabilities Assigning probabilities is a key aspect of the decision model approach to coping with uncertainty. A **probability distribution** describes the likelihood (or probability) of each of the mutually exclusive and collectively exhaustive set of events. The probabilities of these events will add to 1.00 because they are collectively exhaustive. In some cases, there will be much evidence to guide the assignment of probabilities. For example, the probability of obtaining a head in the toss of a fair coin is $\frac{1}{2}$; that of drawing a particular playing card from a standard, well-shuffled deck is $\frac{1}{52}$. In business, the probability of having a specified percentage of defective units may be assigned with great confidence, on the basis of production experience with thousands of units. In other cases, there will be little evidence supporting estimated probabilities. For example, how many units of a new pharmaceutical product will be sold next year?

The concept of uncertainty can be illustrated by a decision situation facing a book editor. The editor is deciding between publishing a spy novel and publishing a historical novel. Both book proposals require a \$200,000 investment at the beginning of the year. (For simplicity here, we ignore the time value of money, which is covered in Chapters 22 and 23.) On the basis of experience, the editor believes that the following probability distribution (assume that the sales life of each book is one year) describes the relative likelihood of cash inflows for the next year:

Proposal A: Spy Novel		Proposal B: Historical Novel	
Probability	Cash Inflows	Probability	Cash Inflows
0.10	\$300,000	0.10	\$200,000
0.20	350,000	0.25	300,000
0.40	400,000	0.30	400,000
0.20	450,000	0.25	500,000
0.10	500,000	0.10	800,000
<u>1.00</u>		<u>1.00</u>	

Exhibit 3-6 compares the probability distributions graphically.

Expected Value An **expected value** is a weighted average of the outcomes with the probability of each outcome serving as the weight. Where the outcomes are measured in monetary terms, *expected value* is often called **expected monetary value**. The expected monetary value of the cash inflows from the spy novel—denoted $E(a_1)$ —is \$400,000:

$$E(a_1) = 0.1(\$300,000) + 0.2(\$350,000) + 0.4(\$400,000) + 0.2(\$450,000) + 0.1(\$500,000) \\ = \$400,000$$

The expected monetary value of the cash inflows from the historical novel—denoted $E(a_2)$ —is \$420,000:

$$E(a_2) = 0.1(\$200,000) + 0.25(\$300,000) + 0.3(\$400,000) + 0.25(\$500,000) + 0.1(\$800,000) \\ = \$420,000$$

Expected monetary value is widely used as a decision criterion. For a book editor wanting to maximize the expected monetary value, the historical novel is preferable to the spy novel.

To interpret expected value, imagine that the company publishes many historical novels, each with a probability distribution of cash inflows given in proposal B. The expected value of \$420,000 is the average cash inflow per novel that the publisher will receive when averaged across all novels. For a specific novel, the cash inflows will be either \$200,000, \$300,000, \$400,000, \$500,000, or \$800,000. But if the company publishes 100 such novels, it will expect to receive \$42 million in total cash inflows, for an average of \$420,000 per novel.

Many statisticians and accountants favor presenting the entire probability distribution to the decision maker. Others present information in three categories: optimistic, most likely, and pessimistic. Either presentation reminds the user that uncertainty exists in the decision at hand.

ILLUSTRATIVE PROBLEM

Reconsider Mary Frost and the booth rental alternatives offered by Computer Conventions, Inc., to sell Do-All software (p. 62):

- ◆ *Option 1:* \$2,000 fixed fee
- ◆ *Option 2:* \$1,400 fixed fee plus 5% of the convention revenues from Do-All sales
- ◆ *Option 3:* 20% of the convention revenues from Do-All sales (but no fixed fee)

Frost estimates a 0.60 probability that sales will be 40 units and a 0.40 probability that sales will be 70 units. Each Do-All software package will be sold for \$200. Frost will purchase the package from a computer software wholesaler at \$120 per unit with the privilege of returning all unsold units. Which booth rental alternative should Mary Frost choose?

General Approach to Uncertainty The construction of a decision model consists of five steps that are keyed to the five characteristics described at the beginning of this appendix.⁴

Step 1 *Identify the choice criterion of the decision maker.* Assume that Mary Frost's choice criterion is to maximize expected net cash inflow at the convention.

Step 2 *Identify the set of alternative actions under consideration.* The notation for an action is a . Mary Frost has three possible actions:

- a_1 = Pay \$2,000 fixed fee
- a_2 = Pay \$1,400 fixed fee plus 5% of convention revenues
- a_3 = Pay 20% of convention revenues (but no fixed fee)

Step 3 *Identify the set of relevant events that can occur.* Mary Frost's only uncertainty is the number of units of Do-All software that she can sell. Using x as the notation for an event,

- x_1 = 40 units
- x_2 = 70 units

⁴The presentations here draw (in part) from teaching notes prepared by R. Williamson.

EXHIBIT 3-7
Decision Table for Do-All Software

Actions	Probability of Events	
	$x_1 = 40 \text{ units sold}$ $P(x_1) = 0.60$	$x_2 = 70 \text{ units sold}$ $P(x_2) = 0.40$
a_1 : Pay \$2,000 fixed fee	\$1,200 ^l	\$3,600 ^m
a_2 : Pay \$1,400 fixed fee plus 5% of convention revenues	\$1,400 ⁿ	\$3,500 ^p
a_3 : Pay 20% of convention revenues (but no fixed fee)	\$1,600 ^q	\$2,800 ^r

^l Net cash flows = $(\$200 - \$120)(40) - \$2,000 = \$1,200$
^m Net cash flows = $(\$200 - \$120)(70) - \$2,000 = \$3,600$
ⁿ Net cash flows = $(\$200 - \$120 - \$10^*)(40) - \$1,400 = \$1,400$
^p Net cash flows = $(\$200 - \$120 - \$10^*)(70) - \$1,400 = \$3,500$
^q Net cash flows = $(\$200 - \$120 - \$40^{**})(40) = \$1,600$
^r Net cash flows = $(\$200 - \$120 - \$40^{**})(70) = \$2,800$
^{*}\$10 = 5% of selling price of \$200
^{**}\$40 = 20% of selling price of \$200

Step 4 Assign the set of probabilities for the events that can occur. Frost assesses a 60% chance that she will sell 40 units and a 40% chance that she will sell 70 units. Using $P(x)$ as the notation for the probability of an event, the probabilities are

$$P(x_1) = 0.60$$

$$P(x_2) = 0.40$$

Step 5 Identify the set of possible outcomes that are dependent on specific actions and events. The outcomes in this example take the form of six possible net cash flows that are displayed in a decision table in Exhibit 3-7. A **decision table** is a summary of the contemplated actions, events, outcomes, and probabilities of events.

Mary Frost can now use the information in Exhibit 3-7 to compute the expected net cash inflow of each action as follows:

$$\text{Pay \$2,000 fixed fee: } E(a_1) = 0.60(\$1,200) + 0.40(\$3,600) = \$2,160$$

$$\text{Pay \$1,400 fixed fee plus 5\% of revenues: } E(a_2) = 0.60(\$1,400) + 0.40(\$3,500) = \$2,240$$

$$\text{Pay 20\% of revenues (but no fixed fee): } E(a_3) = 0.60(\$1,600) + 0.40(\$2,800) = \$2,080$$

To maximize expected net cash inflows, Frost should select action a_2 —that is, contracting to pay Computer Conventions a \$1,400 fixed fee plus 5% of convention revenues.

Consider the effect of uncertainty on the preferred action choice. If Frost was certain that she would sell only 40 units of Do-All software (that is, $P(x_1) = 1$), she would prefer alternative a_3 —pay 20% of revenues and no fixed fee. To follow this reasoning, examine Exhibit 3-7. When 40 units are sold, alternative a_3 yields the maximum net cash inflows of \$1,600. Because fixed costs are zero, booth rental costs are low when sales are low.

However, if Frost was certain that she would sell 70 units of Do-All software (that is, $P(x_2) = 1$), she would prefer alternative a_1 —pay a \$2,000 fixed fee. Exhibit 3-7 indicates that when 70 units are sold, alternative a_1 yields the maximum net cash inflows of \$3,600. Rental payments under a_2 and a_3 increase with units sold but are fixed under a_1 .

Good Decisions and Good Outcomes Always distinguish between a good decision and a good outcome. One can exist without the other. By definition, uncertainty rules out guaranteeing, after the fact, that the best outcome will always be obtained. It is possible that bad luck will produce unfavorable consequences even when good decisions have been made.

Suppose you are offered a one-time-only gamble tossing a fair coin. You will win \$20 if the event is heads, but you will lose \$1 if the event is tails. As a decision maker, you proceed through the logical phases: gathering information, assessing outcomes, and making a choice. You accept the bet. Why? Because the expected value is \$9.50 [$0.5(\$20) + 0.5(-\$1)$]. The coin is tossed and the event is tails. You lose. From your viewpoint, this was a good decision but a bad outcome.

A decision can be made only on the basis of information available at the time of the decision. Hindsight is flawless, but a bad outcome does not necessarily mean that a bad decision was made. Making a good decision is our best protection against a bad outcome.

TERMS TO LEARN

This chapter and the Glossary at the end of the book contain definitions of the following important terms:

breakeven point (p. 62)	net income (61)
choice criterion (75)	operating income (61)
contribution income statement (63)	outcomes (75)
contribution margin (71)	probability (75)
contribution margin percentage (72)	probability distribution (76)
cost-volume-profit (CVP) (60)	PV graph (65)
decision model (75)	revenues (60)
decision table (78)	revenue driver (60)
events (75)	revenue mix (69)
expected monetary value (76)	sales mix (69)
expected value (76)	sensitivity analysis (65)
gross margin (71)	uncertainty (66)
gross margin percentage (72)	variable-cost percentage (72)
margin of safety (66)	

ASSIGNMENT MATERIAL

QUESTIONS

Note: To underscore the basic CVP relationships, the assignment material ignores income taxes unless stated otherwise.

- 3-1 Describe how the special case labeled CVP is different from the general case for predicting total revenues, total costs, and operating income.
- 3-2 There are many revenue drivers besides units of output sold (or manufactured). Name two.
- 3-3 There are many cost drivers besides units of output sold (or manufactured). Name two.
- 3-4 Distinguish between operating income and net income.
- 3-5 Give three specific ways units of output are measured in different industries.
- 3-6 Describe the assumptions underlying CVP analysis.
- 3-7 Why is it more accurate to describe the subject matter of this chapter as CVP analysis rather than as breakeven analysis?
- 3-8 "CVP is both simple and simplistic. If you want realistic analysis to underpin your decisions, look beyond CVP." Do you agree? Explain.
- 3-9 Describe *sensitivity analysis*. How has the advent of spreadsheet software affected its use?
- 3-10 Define contribution margin, gross margin, contribution margin percentage, variable-cost percentage, and margin of safety.
- 3-11 Give an example of how a manager can decrease variable costs while increasing fixed costs.

- 3-12 Give an example of how a manager can increase variable costs while decreasing fixed costs.
- 3-13 "There is no such thing as a fixed cost. All costs can be 'unfixed' given sufficient time." Do you agree? What is the implication of your answer for CVP analysis?
- 3-14 How can a company with multiple products compute its breakeven point?
- 3-15 How does an increase in the income tax rate affect the breakeven point?

EXERCISES

- 3-16 **CVP computations.** In the following data, fill in the blanks for each of the four independent cases.

Case	Revenues	Variable Costs	Fixed Costs	Total Costs	Operating Income	Contribution Margin Percentage
a	\$ —	\$500	\$ —	\$ 800	\$1,200	—
b	2,000	—	300	—	200	—
c	1,000	700	—	1,000	—	—
d	1,500	—	300	—	—	40%

- 3-17 **CVP computations.** Fill in the blanks for each of the following independent cases.

Case	Selling Price	Variable Costs Per Unit	Total Units Sold	Total Contribution Margin	Total Fixed Costs	Operating Income
a	\$30	\$20	70,000	\$ 700,000	\$ 715,000	-\$15,000
b	25	25	180,000	900,000	800,000	100,000
c	12	10	150,000	300,000	220,000	80,000
d	20	14	20,000	120,000	108,000	12,000

- 3-18 **CVP, changing revenues and costs.** Sunshine Tours is a travel agency specializing in flights between Toronto and Jamaica. It books passengers on Canadian Air. Canadian Air charges passengers \$1,000 per round-trip ticket. Sunshine receives a commission of 8% of the ticket price paid by the passenger. Sunshine's fixed costs are \$22,000 per month. Its variable costs are \$35 per ticket, including an \$18 delivery fee by Emory Express. (Assume each ticket purchased is delivered in a separate package; thus the delivery fee applies to every individual ticket.)

REQUIRED

- What is the number of tickets Sunshine must sell each month to (a) breakeven, and (b) make a target operating income of \$10,000?
- Assume TNT Express offers to charge Sunshine only \$12 per ticket delivered. How would accepting this offer affect your answers to (a) and (b) in requirement 1?

- 3-19 **CVP, changing revenues and costs (continuation of 3-18).** Canadian Air changes its commission structure to travel agents. Up to a ticket price of \$600, the 8% commission applies. For tickets costing \$600 or more, there is a fixed commission of \$48. Assume Sunshine Tours has fixed costs of \$22,000 per month and variable costs of \$29 per ticket (including a \$12 delivery fee by TNT).

REQUIRED

- What is the number of Toronto-to-Jamaica round-trip tickets Sunshine must sell each month to (a) breakeven, and (b) make a target operating income of \$10,000? Comment on the results.

2. Sunshine tours decides to charge its customers a delivery fee of \$5 per ticket. How would this change affect your answers to (a) and (b) in requirement 1? Comment on the results.

3-20 CVP exercises. The Super Donut owns and operates six donut outlets in and around Kansas City. You are given the following corporate budget data for next year:

Revenues	\$10,000,000
Fixed costs	1,700,000
Variable costs	8,200,000

Variable costs change with respect to the number of donuts sold.

REQUIRED

Compute the budgeted operating income for each of the following deviations from the original budget data. (Consider each case independently.)

1. A 10% increase in contribution margin, holding revenues constant
2. A 10% decrease in contribution margin, holding revenues constant
3. A 5% increase in fixed costs
4. A 5% decrease in fixed costs
5. An 8% increase in units sold
6. An 8% decrease in units sold
7. A 10% increase in fixed costs and 10% increase in units sold
8. A 5% increase in fixed costs and 5% decrease in variable costs

H 3-21 CVP exercises. The Doral Company manufactures and sells pens. Present sales output is 5,000,000 units per year at a selling price of \$0.50 per unit. Fixed costs are \$900,000 per year. Variable costs are \$0.30 per unit.

REQUIRED

(Consider each case separately.)

1. a. What is the present operating income for a year?
- b. What is the present breakeven point in revenues?

Compute the new operating income for each of the following changes:

2. A \$0.04 per unit increase in variable costs
3. A 10% increase in fixed costs and a 10% increase in units sold
4. A 20% decrease in fixed costs, a 20% decrease in selling price, a 10% decrease in variable costs per unit, and a 40% increase in units sold

Compute the new breakeven point in units for each of the following changes:

5. A 10% increase in fixed costs
6. A 10% increase in selling price and a \$20,000 increase in fixed costs

3-22 CVP, changing cost inputs. Maria Montez is planning to sell a vegetable slicer-dicer for \$15 per unit at a county fair. She purchases units from a local distributor for \$6 each. She can return any unsold units for a full refund. Fixed costs for booth rental, setup, and cleaning are \$450.

REQUIRED

1. Compute the breakeven point in units sold.
2. Suppose the unit purchase cost is \$5 instead of \$6, but the selling price is unchanged. Compute the new breakeven point in units sold.

3-23 CVP, margin of safety. Suppose Lattin Corp's breakeven point is revenues of \$1,000,000. Fixed costs are \$400,000.

REQUIRED

1. Compute the contribution margin percentage.
2. Compute the selling price if variable costs are \$12 per unit.
3. Suppose 80,000 units are sold. Compute the margin of safety.

3-24 CVP, international cost structure differences. Knitwear, Inc., is considering three countries for the sole manufacturing site of its new sweater—Singapore, Thailand, and the United States. All sweaters are to be sold to retail outlets in the United States at \$32 per unit. These retail outlets add their

own markup when selling to final customers. The three countries differ in their fixed costs and variable costs per sweater.

	Annual Fixed Costs	Variable Manufacturing Costs Per Sweater	Variable Marketing and Distribution Costs Per Sweater
Singapore	\$ 6.5 million	\$ 8.00	\$11.00
Thailand	4.5 million	5.50	11.50
United States	12.0 million	13.00	9.00

REQUIRED

1. Compute the breakeven point of Knitwear, Inc., in both (a) units sold, and (b) revenues for each of the three countries considered for manufacturing the sweaters.
2. If Knitwear, Inc., sells 800,000 sweaters in 19_4, what is the budgeted operating income for each of the three countries considered for manufacturing the sweaters? Comment on the results.

3-25 Revenue mix, new and upgrade customers. Zapo 1-2-3 is a top-selling spreadsheet product. Zapo is about to release version 5.0. It groups its customers into two groups—new customers and upgrade customers (those who previously purchased Zapo 1-2-3 4.0 or earlier versions). Although the same physical product is provided to each customer group, sizable differences exist in their selling prices and variable marketing costs:

	New Customers		Upgrade Customers	
Selling price		\$210		\$120
Variable cost				
Manufacturing	\$25		\$25	
Marketing	<u>65</u>	<u>90</u>	<u>15</u>	<u>40</u>

The fixed costs of Zapo 5.0 are \$14,000,000.

The planned revenue mix in units is 60% new customers and 40% upgrade customers.

REQUIRED

1. What is the Zapo 1-2-3 5.0 breakeven point in units, assuming that the planned 60%/40% mix is maintained?
2. If the mix is maintained, what is the operating income when 200,000 units are sold?
3. Show how the breakeven point in units changes with the following customer mixes:
 - a. New 50%/Upgrade 50%
 - b. New 90%/Upgrade 10%

Comment on the results.

3-26 CVP, income taxes. The Bratz Company has fixed costs of \$300,000 and a variable-cost percentage of 80%. The company earns net income of \$84,000 in 19_4. The income tax rate is 40%.

REQUIRED

Compute (1) operating income, (2) contribution margin, (3) total revenues, and (4) breakeven revenues.

3-27 CVP, income taxes. The Rapid Meal has two restaurants that are open 24 hours a day. Fixed costs for the two restaurants together total \$450,000 per year. Service varies from a cup of coffee to full meals. The average sales check for each customer is \$8.00. The average cost of food and other variable costs for each customer is \$3.20. The income tax rate is 30%. Target net income is \$105,000.

REQUIRED

1. Compute the revenues needed to obtain the target net income.
2. How many sales checks are needed to earn net income of \$105,000? To breakeven?
3. Compute net income if the number of sales checks is 150,000.

3-28 Appendix, uncertainty, CVP. Angela King is the Las Vegas promoter for Mike Foreman. King is promoting a new world championship fight for Foreman. The key area of uncertainty is the size of the cable pay-per-view TV market. King will pay Foreman a fixed fee of \$2 million and 25% of net cable pay-per-view revenue. Every cable TV home receiving the event pays \$29.95, of which King receives \$16. King pays Foreman 25% of the \$16.

King estimates the following probability distribution for homes purchasing the pay-per-view event:

Demand	Probability
100,000	0.05
200,000	0.10
300,000	0.30
400,000	0.35
500,000	0.15
1,000,000	0.05

REQUIRED

1. What is the expected value of the payment King will make to Foreman?
2. Assume the only uncertainty is over cable TV demand for the fight. King wants to know the breakeven point given her own fixed costs of \$1 million and her own variable costs of \$2 per home. (Also include King's payments to Foreman in your answer).

PROBLEMS

3-29 CVP, executive teaching compensation. Brian Smith is an internationally known American professor specializing in consumer marketing. In 19_2, Smith and the United Kingdom Business School (UKBS) agreed to conduct a one-day seminar at UKBS for marketing executives. Each executive would pay £260 to attend the one-day seminar. The dean at UKBS indicates to Smith that the non-speaker related fixed costs for UKBS conducting the seminar would be

Advertising in magazines	£4,000
Mailing of brochures	£3,000
Administrative labor at UKBS	£2,000
Charge for UKBS lecture auditorium	£1,000

The variable costs to UKBS for each participant attending the seminar would be

Meals and drinks	£25
Binders and photocopying	£35

The dean at UKBS initially offered Smith its regular compensation package of (a) business-class airfare and accommodation (£3,000 maximum) and (b) a £2,000 lecture fee. Smith would qualify for the £3,000 maximum allowance. Smith views the £2,000 lecture fee as providing him no upside potential (that is, no sharing in the potential additional operating income that arises if the seminar is highly attended). He suggests instead that he

receive 50% of the operating income to UKBS (if positive) from the one-day seminar and no other payments. The dean of UKBS quickly agrees to Smith's proposal after confirming that Smith is willing to pay his own airfare and accommodation and deliver the seminar irrespective of the number of executives signed up to attend.

REQUIRED

1. What is UKBS's breakeven point (in number of executives attending) if
 - a. Smith accepts the regular compensation package of £3,000 expenses and a £2,000 lecture fee.
 - b. Smith receives 50% of the operating income to UKBS (if positive) from the one-day seminar and no other payments.

Comment on the results for (a) and (b).

2. Smith gave the one-day seminar at UKBS in 19_2 (60 attended), 19_3 (90 attended), and 19_4 (180 attended). How much was Smith paid by UKBS for the one-day seminar under the 50% of UKBS's operating income compensation plan in (a) 19_2, (b) 19_3, and (c) 19_4? (Assume that the £260 charge per executive attending and UKBS's fixed and variable costs are the same each year.)
3. After the 19_4 seminar, the dean at UKBS suggested to Smith that the 50%–50% profit-sharing plan was resulting in Smith getting excessive compensation in 19_4 and that a more equitable arrangement to UKBS be used in 19_5. How should Smith respond to this suggestion?

- 3-30 CVP, movie production.** Royal Rumble Productions has just finished production of *Feature Creatures*, the latest action film directed by Tony Savage and starring Ralph Michaels and Sally Martel. The total production cost to Royal Rumble was \$5 million. All the production personnel and actors on *Feature Creatures* received a fixed salary (included in the \$5 million) and will have no "residual" (equity interest) in the revenues or operating income from the movie. Media Productions will handle the marketing of *Feature Creatures*. Media agrees to invest a minimum \$3 million of its own money in marketing the movie and will be paid 20% of the revenues Royal Rumble itself receives from the box-office receipts. Royal Rumble receives 62.5% of the total box-office receipts (out of which comes the 20% payment to Media Productions).

REQUIRED

1. What is the breakeven point to Royal Rumble for *Feature Creatures* expressed in terms of (a) revenues received by Royal Rumble, and (b) total box-office receipts?
2. Assume in its first year of release, the box-office receipts for *Feature Creatures* total \$300 million. What is the operating income to Royal Rumble from the movie in its first year?

- 3-31 CVP, cost structure differences, movie production (continuation of 3-30).** Royal Rumble is negotiating for *Feature Creatures 2*, a sequel to its mega-blockbuster *Feature Creatures*. This negotiation is proving more difficult than for the original movie. The budgeted production cost (excluding payments to the director Savage and the stars Michaels and Martel) for *Feature Creatures 2* is \$21 million. The agent negotiating for Savage, Michaels, and Martel proposes either of two contracts:

Contract A: Fixed-salary component of \$15 million for Savage, Michaels, and Martel (combined) with no residual interest in the revenues from *Feature Creatures 2*.

Contract B: Fixed-salary component of \$3 million for Savage, Michaels, and Martel (combined) plus a residual of 15% of the revenues Royal Rumble receives from *Feature Creatures 2*.

Media Productions will market *Feature Creatures 2*. It agrees to invest a minimum of \$10 million of its own money. Because of its major role in the success of *Feature Creatures*, Media Productions will now be paid 25% of the revenues Royal Rumble receives from the total box-office receipts. Royal

Rumble receives 62.5% of the total box-office receipts (out of which comes the 25% payment to Media Productions).

REQUIRED

1. What is the breakeven point for Royal Rumble expressed in terms of
 - a. revenues received by that company
 - b. total box-office receipts for *Feature Creatures 2*for contracts A and B? Explain the difference between the breakeven points for contracts A and B.
2. Assume *Feature Creatures 2* achieves the same \$300 million in box-office revenues as *Feature Creatures*. What is the operating income to Royal Rumble from *Feature Creatures 2* if it accepts contract B? Comment on the difference in operating income between the two films.

3-32 CVP, sensitivity analysis. Hoot Washington is the newly elected charismatic leader of the Republican Party. He is the darling of the right-wing media. His “take no prisoners” attitude has left many an opponent on a talk show feeling run over by a Mack truck.

Media Publishers is negotiating to publish *Hoot’s Manifesto*, a new book that promises to be an instant bestseller. The fixed costs of producing and marketing the book will be \$500,000. The variable costs of producing and marketing will be \$4.00 per book. These costs are before any payments to Hoot. Hoot negotiates an up-front payment of \$3 million plus a 15% royalty rate on the net sales price of each book. The net sales price is the listed bookstore price of \$30 minus the margin paid to the bookstore to sell the book. The normal bookstore margin of 30% of the listed bookstore price is expected to apply.

REQUIRED

1. Present a PV graph for Media Publishers.
2. How many copies must Media Publishers sell to (a) breakeven, and (b) earn a target operating profit of \$2 million?
3. Examine the sensitivity of the breakeven point to the following changes:
 - a. Decreasing the normal bookstore margin to 20% of the listed bookstore price of \$30.
 - b. Increasing the listed bookstore price to \$40 while keeping the bookstore margin at 30%.

Comment on the results.

3-33 CVP, changing inputs (continuation of 3-32). Hoot Washington’s up-front payment of \$3 million attracts a lot of negative publicity. His opponents claim he is “in bed” with the right-wing owner of Media Publishers. Congress is considering relaxing some key media ownership restrictions that would expand the opportunities available to many media companies. Hoot and Media Publishers decide to drop the \$3 million up-front payment, but make Hoot’s royalty rate 20% of the listed bookstore price of \$30. The normal bookstore margin of 30% of the listed bookstore price is expected to apply.

REQUIRED

1. Present a PV graph for Media Publishers with the revised contract.
2. How many copies must Media Publishers sell to (a) breakeven, and (b) earn a target operating profit of \$2 million? Compare your answers with those in requirement 2 of Problem 3-32.
3. What number of copies must Media Publishers sell for Hoot to be indifferent to receiving either (a) a \$3 million up-front payment and a 15% royalty rate, on net sales price, or (b) no up-front payment and a 20% royalty rate on listed bookstore price?



3-34 CVP, shoe stores. The Walk Rite Shoe Company operates a chain of shoe stores. The stores sell ten different styles of inexpensive men’s shoes with identical unit costs and selling prices. A unit is defined as a pair of shoes. Each store has a store manager who is paid a fixed salary. Individual salespeople receive a fixed salary and a sales commission. Walk Rite is trying to

determine the desirability of opening another store, which is expected to have the following revenue and cost relationships:

	Per Pair
Unit variable data	
Selling price	\$30.00
Cost of shoes	\$19.50
Sales commissions	1.50
Total variable costs	\$21.00
Annual fixed costs	
Rent	\$ 60,000
Salaries	200,000
Advertising	80,000
Other fixed costs	20,000
Total fixed costs	\$360,000

REQUIRED

(Consider each question independently.)

1. What is the annual breakeven point in (a) units sold, and (b) revenues?
2. If 35,000 units are sold, what will be the store's operating income (loss)?
3. If sales commissions were discontinued for individual salespeople in favor of an \$81,000 increase in fixed salaries, what would be the annual breakeven point in (a) units sold, and (b) revenues?
4. Refer to the original data. If the store manager were paid \$0.30 per unit sold in addition to his current fixed salary, what would be the annual breakeven point in (a) units sold, and (b) revenues?
5. Refer to the original data. If the store manager were paid \$0.30 per unit commission on each unit sold in excess of the breakeven point, what would be the store's operating income if 50,000 units were sold? (This \$0.30 is in addition to both the commission paid to the sales staff and the store manager's fixed salary.)

3-35 CVP, shoe stores. Refer to requirement 3 of 3-34.

REQUIRED

1. Calculate the number of units sold where the operating income under (a) a fixed-salary plan, and (b) a lower fixed-salary and commission plan (for salespeople only) would be equal. Above that number of units sold, one plan would be more profitable than the other; below that number of units sold, the reverse would occur.
2. Compute the operating income or loss under each plan in requirement 1 at sales levels of (a) 50,000 units, and (b) 60,000 units.
3. Suppose the target operating income is \$168,000. How many units must be sold to reach the target under (a) the fixed-salary plan, and (b) the lower fixed-salary and commission plan?

3-36 Sensitivity and inflation (continuation of 3-35). As president of Walk Rite, you are concerned that inflation may squeeze your profitability. Specifically, you feel committed to the \$30 selling price and fear that diluting the quality of the shoes in the face of rising costs would be an unwise marketing move. You expect the cost of shoes to rise by 10% during the coming year. You are tempted to avoid the cost increase by placing a noncancelable order with a large supplier that would provide 50,000 units of the specified quality for each store at \$19.50 per unit. (To simplify this analysis, assume that all stores will face identical demands.) These shoes could be acquired and paid for as delivered throughout the year. However, all shoes must be delivered to the stores by the end of the year.

As a shrewd merchandiser, you foresee some risks. If sales were less than 50,000 units, you feel that markdowns of the unsold merchandise would be necessary to sell the goods. You predict that the average selling price of the leftover units would be \$18.00. The regular commission of 5% of revenues would be paid to salespeople.

REQUIRED

1. Suppose that actual sales at \$30 for the year is 48,000 units and that you contracted for 50,000 units. What is the operating income for the store?
2. If you had perfect forecasting ability, you would have contracted for 48,000 units rather than 50,000 units. What would the operating income have been if you had ordered 48,000 units?
3. Given actual sales of 48,000 units, by how much would the average cost per unit have had to rise before you would have been indifferent between having the contract for 50,000 units and not having the contract?

3-37 Revenue mix, three products. The Ronowski Company has three product lines of belts—A, B, and C with contribution margins of \$3, \$2, and \$1, respectively. The president foresees sales of 200,000 units in the coming period, consisting of 20,000 units of A, 100,000 units of B, and 80,000 units of C. The company's fixed costs for the period are \$255,000.

REQUIRED

1. What is the company breakeven point in units, assuming that the given revenue mix is maintained?
2. If the mix is maintained, what is the total contribution margin when 200,000 units are sold? What is the operating income?
3. What would operating income become if 20,000 units of A, 80,000 units of B, and 100,000 units of C were sold? What is the new breakeven point in units if these relationships persist in the next period?

3-38 Revenue mix, three products. The Mendez Company has three products, tote bags H, J, and K. The president plans to sell 200,000 units during the next period, consisting of 80,000 units of H, 100,000 units of J, and 20,000 units of K. The products have unit contribution margins of \$2, \$3, and \$6, respectively. The company's fixed costs for the period are \$406,000.

REQUIRED

1. Compute the budgeted operating income. Compute the breakeven point in units, assuming that the given revenue mix is maintained.
2. Suppose 80,000 units of H, 80,000 units of J, and 40,000 units of K are sold. Compute the budgeted operating income. Compute the new breakeven point in units if these relationships persist in the next period.

3-39 Revenue mix, two products. The Goldman Company retails two products, a standard and a deluxe version of a luggage carrier. The budgeted income statement is as follows:

	Standard Carrier	Deluxe Carrier	Total
Units sold	150,000	50,000	200,000
Revenues @ \$20 and \$30 per unit	\$3,000,000	\$1,500,000	\$4,500,000
Variable costs @ \$14 and \$18 per unit	2,100,000	900,000	3,000,000
Contribution margins @ \$6 and \$12 per unit	\$ 900,000	\$ 600,000	1,500,000
Fixed costs			1,200,000
Operating income			\$ 300,000

REQUIRED

1. Compute the breakeven point in units, assuming that the planned revenue mix is maintained.
2. Compute the breakeven point in units (a) if only standard carriers are sold, and (b) if only deluxe carriers are sold.

3. Suppose 200,000 units are sold, but only 20,000 are deluxe. Compute the operating income. Compute the breakeven point if these relationships persist in the next period. Compare your answers with the original plans and the answer in requirement 1. What is the major lesson of this problem?

3-40 CVP, nonprofit event planning. The American-Canadian Chamber of Commerce is planning its July 4 gala ball. There are two possible plans:

- a. Toronto Country Golf Club, which has a fixed rental cost of \$2,000 plus a charge of \$80 per person for its own catering of meals and serving of drinks and hors d'oeuvres.
- b. Toronto Town Hall, which has a fixed rental cost of \$6,600. The Chamber of Commerce can hire a caterer for meals and waiters and waitresses to serve drinks and hors d'oeuvres at \$60 per person.

The Chamber of Commerce budgets \$3,500 in costs for administration and marketing. The band will cost a fixed amount of \$2,500. Tickets to this prestige event will be \$120 per person. All the drinks served and the prizes given away at the ball will be donated by corporate sponsors.

REQUIRED

1. Compute the breakeven point for each plan in terms of tickets sold.
2. Compute the operating income of the ball (a) if 150 people attend, and (b) if 300 people attend. Comment on your results.
3. At what level of tickets sold will the two plans have the same operating income?

3-41 Nonprofit institution. The City of Little Rock, Arkansas, makes a \$400,000 lump-sum budget appropriation to an agency to conduct a counseling program for drug addicts for a year. All of the appropriation is to be spent. The variable costs for drug prescriptions average \$400 per patient per year. Fixed costs are \$150,000.

REQUIRED

1. Compute the number of patients that could be served in a year.
2. Suppose the total budget for the following year is reduced by 10%. Fixed costs are to remain the same. The same level of service to each patient will be maintained. Compute the number of patients that could be served in a year.
3. As in requirement 2, assume a budget reduction of 10%. Fixed costs are to remain the same. The drug counselor has discretion as to how much in drug prescriptions to give to each patient. She does not want to reduce the number of patients served. On the average, what is the cost of drugs that can be given to each patient? Compute the percentage decline in the annual average cost of drugs per patient.

3-42 CVP, income taxes. (CMA) The R. A. Ro and Company, a manufacturer of quality handmade walnut bowls, has experienced a steady growth in sales for the past five years. However, increased competition has led Mr. Ro, the president, to believe that an aggressive marketing campaign will be necessary next year to maintain the company's present growth.

To prepare for next year's marketing campaign, the company's controller has prepared and presented Mr. Ro with the following data for the current year, 19_7:

Variable costs (per bowl)	
Direct manufacturing labor	\$ 8.00
Direct materials	3.25
Variable overhead	
(Manufacturing, marketing distribution, customer service, and administration)	2.50
Total variable costs	<u>\$13.75</u>

Fixed costs	
Manufacturing	\$ 25,000
Marketing, distribution, and customer service	40,000
Administrative	70,000
Total fixed costs	<u>\$135,000</u>
Selling price per bowl	\$ 25.00
Expected revenues, 19_7 (20,000 units)	\$500,000
Income tax rate	40%

REQUIRED

1. What is the projected net income for 19_7?
2. What is the breakeven point in units for 19_7?
3. Mr. Ro has set the revenue target for 19_8 at a level of \$550,000 (or 22,000 bowls). He believes an additional marketing cost of \$11,250 for advertising in 19_8, with all other costs remaining constant, will be necessary to attain the revenue target. What will be the net income for 19_8 if the additional \$11,250 is spent and the revenue target is met?
4. What will be the breakeven point in revenues for 19_8 if the additional \$11,250 is spent for advertising?
5. If the additional \$11,250 is spent for advertising in 19_8, what is the required 19_8 revenues for 19_8's net income to equal 19_7's net income?
6. At a sales level of 22,000 units, what maximum amount can be spent on advertising if a 19_8 net income of \$60,000 is desired?

3-43 Review of Chapters 2 and 3. For each of the following independent cases, find the unknowns designated by the capital letters.

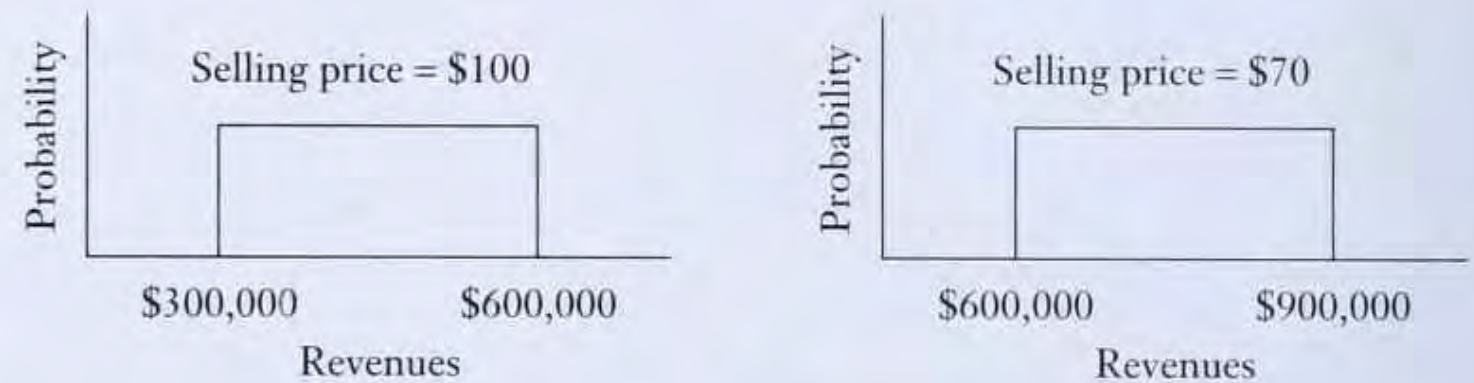
	Case 1	Case 2
Direct materials used	\$ H	\$ 40,000
Direct manufacturing labor	30,000	15,000
Variable marketing, distribution, customer-service, and administrative costs	K	T
Fixed manufacturing overhead	I	20,000
Fixed marketing, distribution, customer-service, and administrative costs	J	10,000
Gross margin	25,000	20,000
Finished goods inventory, January 1, 19_7	0	5,000
Finished goods inventory, December 31, 19_7	0	5,000
Contribution margin (dollars)	30,000	V
Revenues	100,000	100,000
Direct materials inventory, January 1, 19_7	12,000	20,000
Direct materials inventory, December 31, 19_7	5,000	W
Variable manufacturing overhead	5,000	X
Work in process, January 1, 19_7	0	9,000
Work in process, December 31, 19_7	0	9,000
Purchases of direct materials	15,000	50,000
Breakeven point (in dollars)	66,667	Y
Cost of goods manufactured	G	U
Operating income (loss)	L	(5,000)

3-44 Appendix, CVP under uncertainty. (J. Patell) In your new position as supervisor of product introduction, you have to decide on a pricing strategy for a talking-doll specialty product with the following cost structure:

Variable costs per unit	\$ 50
Fixed costs	\$200,000

The dolls are manufactured upon receipt of orders, so the inventory levels are insignificant. Your market research assistant is very enthusiastic about probability models and has presented the results of his price analysis in the following form:

- a. If you set the selling price at \$100 per unit, the probability distribution of revenues is uniform between \$300,000 and \$600,000. Under this distribution, there is a 0.50 probability of equaling or exceeding revenues of \$450,000.
- b. If you lower the selling price to \$70 per unit, the distribution remains uniform, but it shifts up to the \$600,000–\$900,000 range. Under this distribution, there is a 0.50 probability of equaling or exceeding revenues of \$750,000.



REQUIRED

1. This is your first big contract, and, above all, you want to show an operating income. You decide to select the strategy that maximizes the probability of breaking even or earning a positive operating income.
 - a. What is the probability of at least breaking even with a selling price of \$100 per unit?
 - b. What is the probability of at least breaking even with a selling price of \$70 per unit?
2. Your assistant suggests that maximum expected operating income might be a better objective to pursue. Which pricing strategy would result in the higher expected operating income? (Use the expected revenues under each pricing strategy when making expected operating income computations.)

3-45 Appendix, CVP under uncertainty. (R. Jaedicke and A. Robichek, adapted) The Jaro Company is considering two new colors for their umbrella products—emerald green and shocking pink. Either can be produced using present facilities. Each product requires an increase in annual fixed costs of \$400,000. The products have the same selling price (\$10) and the same variable costs per unit (\$8).

Management, after studying past experience with similar products, has prepared the following probability distribution:

Event (Units Demanded)	Probability for	
	Emerald Green Umbrella	Shocking Pink Umbrella
50,000	0.0	0.1
100,000	0.1	0.1
200,000	0.2	0.1
300,000	0.4	0.2
400,000	0.2	0.4
500,000	0.1	0.1
	<u>1.0</u>	<u>1.0</u>

REQUIRED

1. What is the breakeven point for each product?
2. Which product should be chosen, assuming the objective is to maximize expected operating income? Why? Show your computations.

3. Suppose management is absolutely certain that 300,000 units of shocking pink will be sold, but it still faces the same uncertainty about the demand for emerald green as outlined in the problem. Which product should be chosen? Why? What benefits are available to management from having the complete probability distribution instead of just an expected value?

3-46 Ethics, CVP, cost analysis. Bob Allen is the controller of the Body Products Division of World Wide Drugs (WWD). It is located in Minneapolis, which is also the headquarters of WWD. Allen is helping develop a proposal for a new product to be called "Vital Hair." This product is a cream to be rubbed on the scalp to restore hair growth. Cheryl Kelly, president of the division, and Allen are scheduled to make a presentation to the WWD Executive Committee on the expected profitability of Vital Hair. The fixed costs associated with the development, production, and marketing of Vital Hair are \$20,000,000. Each customer will pay a doctor \$80 per monthly treatment, of which \$55 is paid to WWD. Allen estimates WWD's variable costs per treatment to be \$22. Included in this \$22 is \$8 for potential product litigation costs. Kelly is livid at Allen for including the \$8 estimate. She argues that it is imperative to get the R&D funds approved (and quickly) and that any number that increases the breakeven point reduces the likelihood of the Vital Hair project being approved. She notes that WWD has had few successful lawsuits against it, in contrast to some recent "horrendous" experiences of competitors with breast implant products. Moreover, she is furious that Allen put the \$8 amount in writing. "How do we know there will be any litigation problem?" She suggests Allen redo the report excluding the \$8 litigation risk cost estimate. "Put it on the chalkboard in the executive committee room, if you insist, but don't put it in the report sent to the committee prior to the meeting. You can personally raise the issue at the executive committee meeting and have a full and frank discussion."

Allen takes Kelly's "advice." He reports a variable cost of \$14 per treatment in the proposal. While he feels uneasy about this, he is comforted by the fact that he will flag the \$8 amount to the executive committee in his forthcoming oral presentation.

One month later, Kelly walks into Allen's office. She is in a buoyant mood and announces she has just come back from an executive committee meeting that approved the Vital Hair proposal. Allen asks why he was not invited to the meeting. Kelly said the meeting was held in New Orleans, and she decided to save the division money by going alone. She then said to Allen that it "was now time to get behind the new venture and help make it the success the committee and her team members believe it will be."

REQUIRED

1. What is the breakeven point (in units of monthly treatments) when WWD's variable costs (a) include the \$8 estimate, and (b) exclude the \$8 estimate for potential product litigation costs?
2. Should Allen have excluded the \$8 estimate in his report to the executive committee of WWD? Explain your answer.
3. What should Allen do in response to Kelly's decision to make the Vital Hair presentation on her own?

COLLABORATIVE LEARNING PROBLEM

3-47 CVP, theater planning. The *New York Herald* has just published a stinging criticism of the inflation in theater ticket prices. The article was titled, "The \$75 Price Gouge. Is \$100 Next?" This article has increased the concerns of a group planning New York's latest production of *Phantom of the Opera*. It had been planning for a \$75 price for all of its seats. The up-front fixed costs to open are \$8 million. Production and operating costs are \$400,000 per week. The theater has capacity for 2,000 seats with six performances per week planned. Approximately 100 seats per night are held as complementary house seats.

INSTRUCTIONS

Form groups of two or more students to complete the following requirements.

REQUIRED

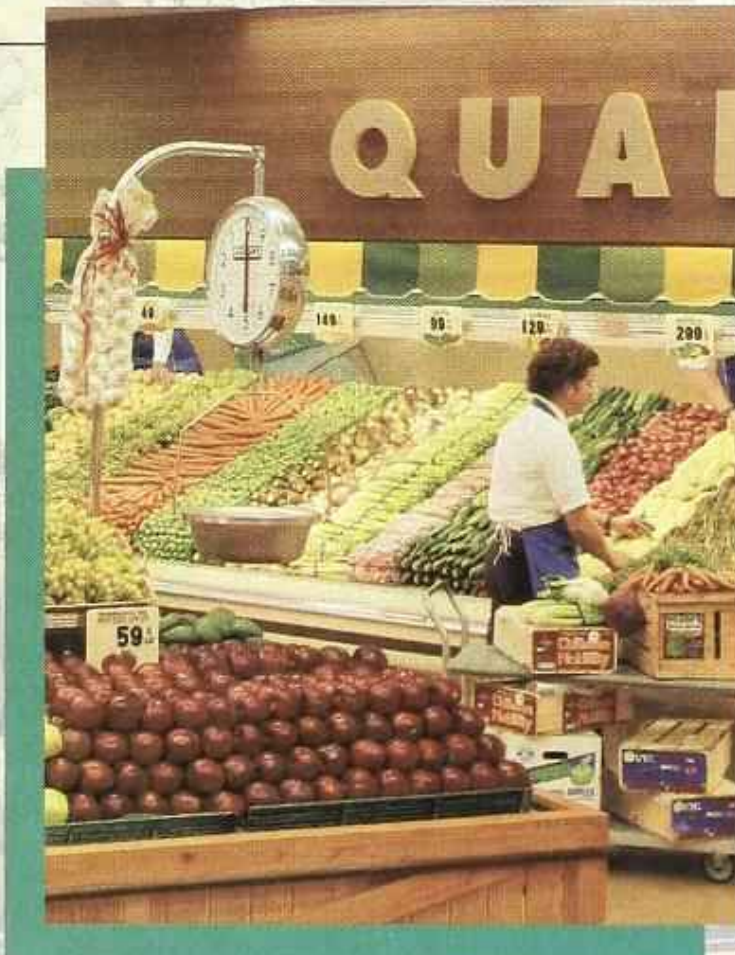
Your group is charged with exploring ways of improving the profitability of the venture and of reducing its breakeven point. Areas you should explore (but are not restricted to) include the following:

- a. Increase the number of shows per week. The cast is under contract for up to eight shows a week for a fixed amount that is included in the \$400,000.
- b. Provide the two star performers (the Phantom and Christine) with a \$25,000 weekly salary and a percentage of revenues or operating income instead of the fixed \$50,000 per week each is budgeted to receive.
- c. Change the single \$75 pricing policy. Whereas all seats in the 2,000-person auditorium have unobstructed views, a recent theater reviewer referred to the back rows of the balcony section as "binocular land."

4

CHAPTER

COSTING SYSTEMS AND ACTIVITY-BASED COSTING (I): SERVICE AND MERCHANDISING APPLICATIONS



Retail stores are using activity-based costing to assist in deciding the square footage to allocate to individual products and product areas. ABC cost data, along with information on customer-demand preferences, are enabling many retailers to increase the operating income of the stores they manage.

LEARNING OBJECTIVES

After studying this chapter, you should be able to

1. Describe the building block concept of costing systems
2. Distinguish between job costing and process costing
3. Outline a six-step approach to job costing
4. Distinguish among actual costing, normal costing, and extended normal costing methods
5. Explain undercosting and overcosting of products
6. Describe three guidelines for refining a costing system
7. Describe the distinctive feature of activity-based costing
8. Prepare product-line profitability reports for companies in the merchandising sector

How much does it cost Arthur Andersen to audit Federal Express? How much does it cost Safeway to sell a six-pack of Pepsi-Cola? How much does it cost the Ford Motor Company to manufacture and sell a Ford Bronco to a dealer? Managers ask these questions for many purposes, including formulating overall strategies, product and service emphasis and pricing, cost control and meeting external reporting obligations. Chapters 4 and 5 present concepts and techniques that guide the responses to such questions. Chapter 4 presents examples from the service and merchandising sectors. Examples from the manufacturing sector are presented in Chapter 5.

Before we explore the details of costing systems, three points are worth noting:

1. The cost-benefit approach we discussed in Chapter 1 is essential in designing and choosing costing systems. The costs of elaborate systems, including the costs of educating managers and other personnel, can be quite high. Managers should install a more sophisticated system only if they believe that its benefits will outweigh its costs.
2. Systems should be tailored to the underlying operations, and not vice versa. Any significant change in underlying operations is likely to justify a corresponding change in the accompanying costing systems. The best system's design begins with a careful study of how operations are conducted and a resulting determination of which information to gather and report. The worst systems are those that operating managers perceive as misleading or useless.
3. Costing systems aim to report cost numbers that indicate the manner in which particular cost objects—such as products, services, and customers—use the resources of an organization.

BUILDING BLOCK CONCEPT OF COSTING SYSTEMS

OBJECTIVE 1

Describe the building block concept of costing systems

We will now review some terms introduced in Chapter 2 that we will use in discussing costing systems:

- ◆ *Cost object*—anything for which a separate measurement of costs is desired.
- ◆ *Direct costs of a cost object*—costs that are related to the particular cost object and can be traced to it in an economically feasible (cost-effective) way.
- ◆ *Indirect costs of a cost object*—costs that are related to the particular cost object but cannot be traced to it in an economically feasible (cost-effective) way. Indirect costs are allocated to the cost object using a cost-allocation method.

The relationship among these three concepts is as follows:



Two concepts not previously defined are also important when discussing costing systems:

- ◆ **Cost pool**—a grouping of individual cost items. Cost pools can range from the very broad (such as a companywide total-cost pool for telephones and fax machines) to the very narrow (such as the costs of operating a car used by a traveling salesperson).
- ◆ **Cost-allocation base**—a factor that is the common denominator for systematically linking an indirect cost or group of indirect costs to a cost object. A cost-allocation base can be financial (such as direct labor costs) or nonfinancial (such

as the number of car miles traveled). Companies often seek to use the cost driver of the indirect costs as the cost-allocation base. For example, the number of miles traveled may be used as the base for allocating motor vehicle operating costs among different sales districts.

These five terms constitute the building blocks that we will use to design the costing systems described later in this chapter.

JOB-COSTING AND PROCESS-COSTING SYSTEMS

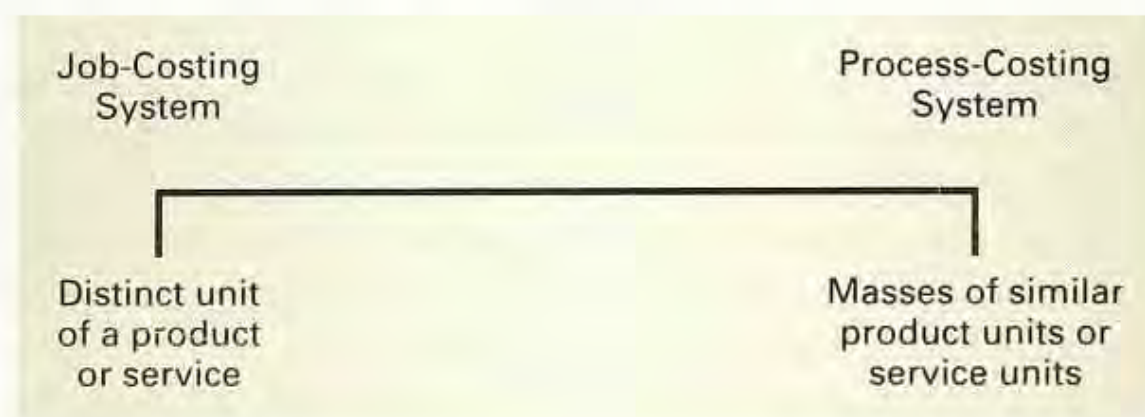
Companies frequently adopt one of two basic types of costing systems to assign costs to products or services:

OBJECTIVE 2

Distinguish between job costing and process costing

- ◆ **Job-costing system.** In this system, costs are assigned to a distinct unit, batch, or lot of a product or service. A job is a task for which resources are expended in bringing a distinct product or service to market. The product or service is often custom-made, such as an audit by an accounting firm.
- ◆ **Process-costing system.** In this system, the cost of a product or service is obtained by using broad averages to assign costs to masses of similar units. Frequently, identical items (such as Barbie dolls or roofing nails) are mass-produced for general sale and not for any specific customer.

These two types of costing systems are best viewed as ends of a continuum:



Most companies have costing systems that are neither pure job costing nor pure process costing. Rather, they combine elements of both job costing and process costing. For now, we introduce these two systems by focusing on their pure versions. Exhibit 4-1 presents examples of job and process costing in the service, merchandising, and manufacturing sectors.

The products or services accounted for with job costing can differ greatly. Accounting firms typically define individual audits as jobs, which can differ markedly in

EXHIBIT 4-1

Examples of Job Costing and Process Costing in the Service, Merchandising, and Manufacturing Sectors

	Service Sector	Merchandising Sector	Manufacturing Sector
Job Costing Used	◆ Accounting firm audits ◆ Advertising agency campaigns	◆ Sending a catalog to a mailing list ◆ Special promotion of a new store product	◆ Aircraft assembly ◆ House construction
Process Costing Used	◆ Deposit processing ◆ Postal delivery (standard items)	◆ Grain dealing ◆ Processing new magazine subscriptions	◆ Oil refining ◆ Beverages production

complexity among clients. An aircraft assembly company may define an individual aircraft for a specific customer as a job. Customers usually differ in their specifications about electronic equipment, size of restrooms, and so on. In these examples, the service or product is distinct and identifiable. Job-costing systems are designed to accommodate the cost accounting for these individual services or products.

Companies that use process costing provide similar (in many cases identical) products or services to their customers. For example, a bank provides the same service to all its customers in processing deposits. A magazine publishing company provides the same product (say, a weekly issue of *Newsweek* or *Time*) to each of its customers. The customers of an oil-refining company all receive the same product—crude oil. Process-costing systems average the costs of providing a similar product or service to different customers to obtain a per unit cost. Chapters 17 and 18 discuss process costing in more detail.

JOB COSTING IN SERVICE ORGANIZATIONS USING ACTUAL COSTING

OBJECTIVE 3

Outline a six-step approach to job costing

Service-sector companies provide their customers with services or intangible products. Within the service sector, jobs often differ considerably in terms of their length, complexity, and resources used. Examples include a service call to repair a refrigerator, an audit engagement, the making of a movie, and a university research project for a government agency.

Job Costing of an Audit Engagement

Lindsay & Associates is a public accounting firm. Each audit engagement is viewed as an individual job. Lindsay bids a fixed fee for each audit in advance of doing the work. A key issue for Lindsay is the cost of an audit engagement. A record of costs on previous jobs enables it to make informed estimates of the costs of potential future jobs. The more knowledgeable Lindsay is about its own costs, the more likely it is to price jobs so that it makes a profit on those accepted.

First, consider the actual costing system Lindsay uses to determine the cost of individual jobs. **Actual costing** is a costing method that traces direct costs to a cost object by using the actual direct-cost rate(s) times the actual quantity of the direct-cost input(s) and allocates indirect costs based on the actual indirect-cost rate(s) times the actual quantity of the cost-allocation base. The Tracy Transport audit illustrates actual costing. In November 19_7, Lindsay was awarded the 19_8 Tracy Transport audit job for a fee of \$86,000. The 19_8 audit job was done in the January to March 19_8 period and covers Tracy Transport's 19_7 financial year.

General Approach to Job Costing

The six steps taken in assigning costs to individual jobs are presented here. They apply equally to job costing in the service, merchandising, or manufacturing sectors.

Step 1: Identify the Job that Is the Chosen Cost Object In this example, the job is the annual audit of the financial statements of Tracy Transport.

Step 2: Identify the Direct Costs for the Job Lindsay identifies only one category of direct costs when costing individual audit jobs—professional labor. Each auditor keeps a daily time record for tracing professional labor-hours to individual audit jobs. These records show that the Tracy Transport job used 800 professional labor-hours. The actual direct-labor cost rate is \$51 per hour.¹ Lindsay traces the actual direct-labor costs for the Tracy Transport job as \$40,800 ($\51×800).

¹The actual direct-labor cost rate is the average rate at which professional labor is paid (actual total professional compensation divided by actual total direct labor hours worked) during the period in which the Tracy Transport audit was done.

Step 3: Identify the Indirect-Cost Pools Associated with the Job Lindsay groups all its individual indirect costs into a single cost pool called audit support. This cost pool represents all costs in Lindsay's Audit Support Department. The indirect cost pool consists of a variety of individual costs, such as general audit and secretarial support, that are less predictable and less traceable to jobs than direct labor. Hence, the actual indirect cost rate can often only be computed on an actual basis at the end of the year. In 19_8, indirect costs totaled \$12,690,000 (\$4,990,000 for "other-labor-related costs" plus \$7,700,000 for "nonlabor-related costs").

Step 4: Select the Cost-Allocation Base to Use in Allocating Each Indirect-Cost Pool to the Job The allocation base selected for the audit support indirect-cost pool is professional labor-hours. Total professional labor-hours actually worked in 19_8 were 270,000.

Step 5: Develop the Rate Per Unit of the Cost-Allocation Base Used to Allocate Indirect Costs to the Job The actual indirect-cost rate for Lindsay in 19_8 is \$47 per professional labor-hour:

$$\begin{aligned}\text{Actual indirect-cost rate} &= \frac{\text{Actual total costs in indirect-cost pool}}{\text{Actual total quantity of cost-allocation base}} \\ &= \frac{\$4,990,000 + \$7,700,000}{270,000} = \frac{\$12,690,000}{270,000} \\ &= \$47 \text{ per professional labor-hour}\end{aligned}$$

The actual indirect costs allocated to the Lindsay audit job are \$37,600 (\$47 × 800).

Step 6: Assign the Costs to the Cost Object by Adding all Direct Costs and All Indirect Costs The information from steps 1 to 5 can now be used to compute the 19_8 actual cost of the Lindsay audit:

Direct job costs traced	
Professional labor, \$51 × 800	\$40,800
Indirect job costs allocated	
Audit support, \$47 × 800	37,600
	<u>\$78,400</u>

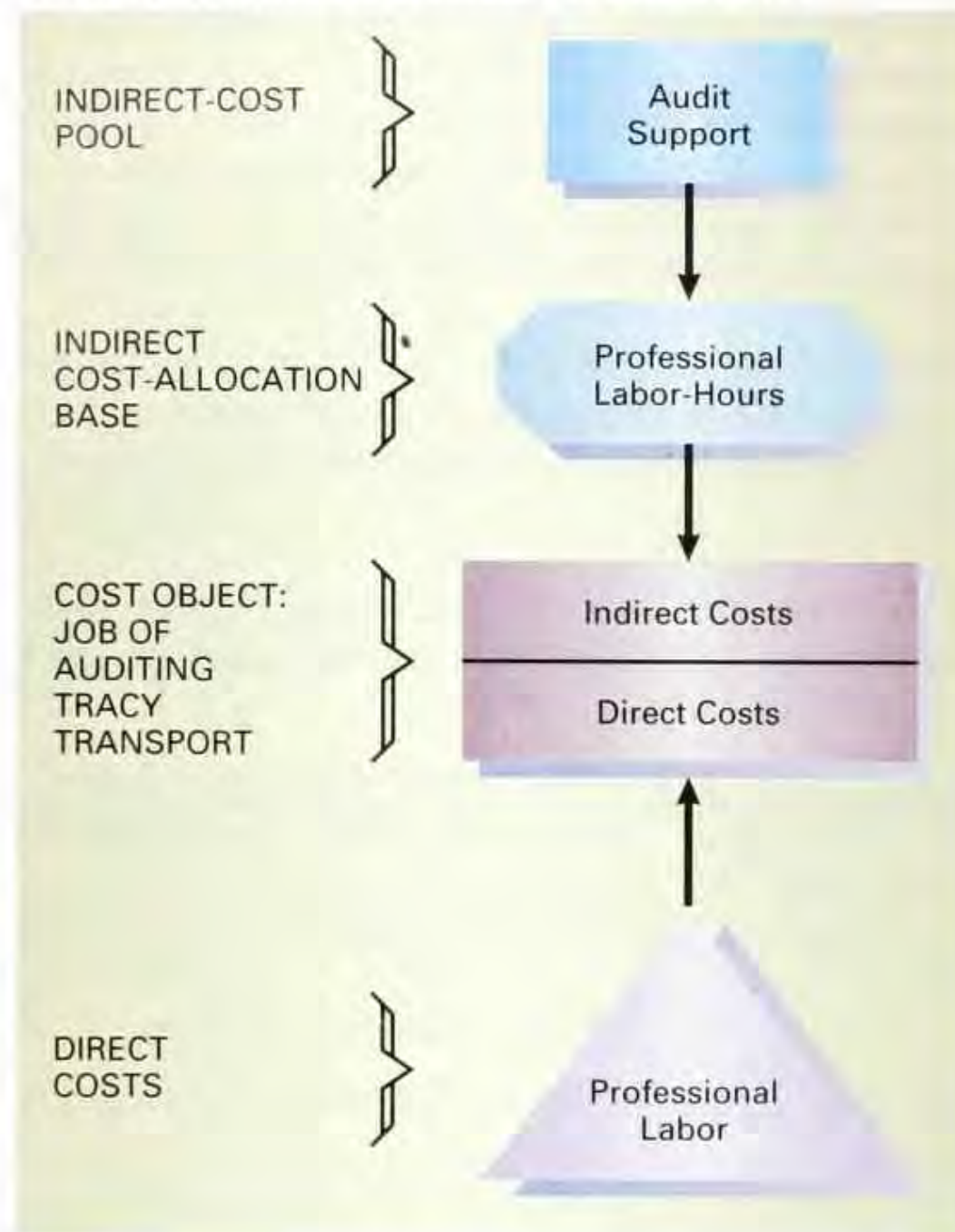
Recall that Lindsay was paid \$86,000 for the 19_8 Tracy Transport audit. Thus, the actual costing system shows a \$7,600 operating income (\$86,000 – \$78,400) on this audit job.

Exhibit 4-2 presents an overview of the Lindsay job-costing system. This exhibit includes the five building blocks of this chapter—cost object, cost pool, direct costs of a cost object, indirect costs of a cost object, and cost-allocation base. Costing-system overviews like Exhibit 4-2 are important learning tools. We urge you to sketch one when you need to understand a costing system. (The symbols in Exhibit 4-2 are used consistently in the costing-system overviews presented in this book. For example, a triangle always identifies a direct cost.)

Source Documents

Managers and accountants gather the information that goes into their cost systems through **source documents**, which are the original records that support journal entries in an accounting system. Time records are Lindsay's main source documents. All professional staff members record how they spend each half-hour of the day. At the end of each week, the number of total professional labor-hours spent on each job (both for the most recent week and the cumulative total since the start of the job) is tabulated. The accuracy of information on how employees spend their time is important, especially in service organizations, where labor costs often make up over *half* of total costs. Accounting and law firms often impose penalties on personnel who do not submit accurate time records when required. Computers ease the recording and preparation of job-cost information.

EXHIBIT 4-2
Job-Costing Overview at Lindsay and Associates



NORMAL COSTING

The difficulty of calculating actual indirect-labor costs for each job means that Lindsay & Associates has to wait until the end of 19_8 to compute the actual costs on individual jobs done in 19_8. Managers often want more timely information about “actual” job costs. This demand for more timely information has prompted the use of alternatives to the actual costing method described earlier in this chapter. The alternatives are practical responses to the desire for a timely approximation of average actual costs of various jobs. Now we discuss normal costing, whereby budgeted rather than actual amounts are used to compute indirect-cost rates. The following 19_8 budgeted data pertain to the *total* operations of Lindsay & Associates:

	Budget
Total professional labor-hours worked	288,000
Direct costs	
Total professional labor costs	\$14,400,000
Indirect costs	
Total other labor-related costs	\$ 5,328,000
Total non labor-related costs	7,632,000
	<u>\$12,960,000</u>

Exhibit 4-3 provides details underlying these amounts.

A **normal costing** method traces direct costs to a cost object by using the actual direct-cost rate(s) times the actual quantity of the direct-cost input and allocates indirect costs based on the budgeted indirect-cost rate(s) times the actual quantity of the cost-allocation base(s). Both actual costing and normal costing trace direct costs to jobs in the same way. For the Lindsay & Associates 19_8 audit of Tracy Transport,

the actual direct costs traced equal \$40,800—the actual direct-cost rate of \$51 per professional labor-hour times the actual quantity of 800 hours.

The difference between the actual costing and normal costing methods is that actual costing uses an *actual* indirect-cost rate while normal costing uses a *budgeted* indirect-cost rate to cost jobs. Recall that Lindsay & Associates groups all its individual indirect costs into a single cost pool called audit support. The budgeted amount for audit support in 19_8 is \$12,960,000. The allocation base for the audit support indirect-cost pool is professional labor-hours. In 19_8, the budgeted quantity is 288,000 hours. The budgeted indirect-cost rate for 19_8 is \$45 per professional labor-hour:

$$\begin{aligned}\text{Budgeted indirect-cost rate} &= \frac{\text{Budgeted total costs in indirect-cost pool}}{\text{Budgeted total quantity of cost-allocation base}} \\ &= \frac{\$5,328,000 + \$7,632,000}{288,000 \text{ hours}} = \frac{\$12,960,000}{288,000 \text{ hours}} \\ &= \$45 \text{ per professional labor-hour}\end{aligned}$$

Under normal costing, each hour of professional labor on jobs in 19_8 is assigned the actual direct-cost rate of \$51 and the budgeted indirect-cost rate of \$45. The 19_8 cost of the Tracy Transport audit using normal costing is \$76,800:

Direct job costs traced	
Professional labor, \$51 × 800	\$40,800
Indirect job costs allocated	
Audit support, \$45 × 800	<u>36,000</u>
	<u>\$76,800</u>

Normal costing uses actual direct costs because these costs are known and can be quickly traced to a job. Indirect costs, by definition, cannot be traced to jobs. Moreover, actual indirect costs are less predictable and not known until the end of the year. Normal costing uses budgeted rates for indirect costs to estimate or approximate the actual indirect costs of a job soon after the job is completed.

EXHIBIT 4-3

Income Statement for Lindsay & Associates: 19_8 Budget and 19_8 Actual Results
(in thousands)

	19_8 Budget		19_8 Actual	
Revenues		\$33,120		\$29,700
Costs				
Professional labor costs		14,400		13,770
Other labor-related costs				
Office staff	\$2,030		\$1,840	
Information specialists	1,008		1,230	
Administrative	1,252		1,100	
Other	<u>1,038</u>	5,328	<u>820</u>	4,990
Nonlabor related costs				
Professional liability insurance	2,160		2,069	
Professional development	880		540	
Occupancy	2,000		1,913	
Phone/fax/copying	1,430		1,530	
Travel and per diem	770		718	
Other	<u>392</u>	<u>7,632</u>	<u>930</u>	<u>7,700</u>
Total costs		<u>27,360</u>		<u>26,460</u>
Operating income		<u>\$ 5,760</u>		<u>\$ 3,240</u>

The housing construction industry illustrates the use of normal costing. Here, materials are purchased at a price known at the purchase date, and labor is paid on an hourly rate basis that is set at the time workers are hired. Actual cost information on both major direct-cost categories can thus be computed as construction takes place. Indirect costs are allocated using a budgeted rate.

Note that normal costing uses a predetermined (budgeted) rate for allocating indirect costs, \$45 here. In contrast, actual costing used a \$47 rate. Chapter 5 discusses alternative approaches to accounting for these differences when reporting individual job costs and when preparing income statements and balance sheets.

TIME PERIOD USED TO COMPUTE INDIRECT-COST RATES

The indirect-cost rates computed for Lindsay & Associates are based on an annual period. Most companies use 6-month or 12-month periods to compute such rates. Few companies use a weekly or monthly period. Why? There are three main reasons.

1. *The numerator reason (budgeted indirect costs).* The shorter the budget period, the greater the influence of seasonal patterns on the level of costs. For example, if a monthly budget period were used, costs of heating (included in the numerator) would be charged only to winter months. The use of an annual period will incorporate the effect of all four seasons into a single indirect-cost rate.

Levels of total indirect costs are also affected by nonseasonal erratic costs. Examples include costs incurred in a particular month that benefit operations during future months: repairs and maintenance of equipment, professional fees, recruiting expenses, and marketing outlays.

2. *The denominator reason (budgeted quantity of the allocation base).* Another rationale for longer budget periods is the spreading of fixed indirect costs over fluctuating activity. Some indirect costs (for example, supplies) may be variable with respect to the cost-allocation base, whereas other indirect costs are fixed (for example, property taxes and rent).

The nonuniform design of the calendar affects the calculation of monthly indirect-cost rates. The number of Monday-to-Friday workdays in a month varies from 20 to 23 during a year. If separate rates are computed each month, jobs undertaken in February, the shortest month, would bear a greater share of indirect costs (such as depreciation and property taxes) than jobs undertaken in March. Many managers believe such results to be unreasonable. Use of an annual budget period reduces the effect that the number of working days per month has on unit costs.

Consider a professional services firm that has a highly seasonal workload. Many firms that provide tax advice and prepare tax returns experience more than 80% of their workload in the 4 months subsequent to the end of the tax year. Assume the following mix of variable indirect costs (such as phone, fax, and photocopying) and fixed indirect costs (insurance and rent):

	Budgeted Indirect Costs			Budgeted Professional Labor-Hours	Allocation Rate per Professional Labor-Hour
	Variable	Fixed	Total		
High-output month	\$40,000	\$60,000	\$100,000	3,200	\$31.25
Low-output month	10,000	60,000	70,000	800	87.50

Because of the fixed costs of \$60,000, budgeted monthly indirect-cost rates can vary sizably—from \$31.25 per hour to \$87.50 per hour in our example. Few managers believe that identical jobs done in different months should be allocated indirect-cost charges per hour that differ so significantly ($\$87.50 \div \$31.25 = 280\%$). For the tax season, management has committed itself to a specific level of capacity far beyond a mere 30 days per month. An average, annualized rate based on the rela-

tionship of total annual indirect costs to the total annual level of output will smooth out the effect of monthly variations in output levels.

3. *The cost-benefit reason.* Revising indirect-cost rates takes management effort. The shorter the budget period, the more often managers must reestimate the numerator and the denominator. Most managers believe that a budget period shorter than 6 or 12 months provides few—if any—additional benefits to justify the additional management effort.

EXTENDED NORMAL COSTING

Different organizations design their own variations of normal costing systems. These systems primarily aim at obtaining approximations of actual costs of jobs, but they use average costing rates in an assortment of ways. For instance, in the Lindsay & Associates example, actual direct-labor costs may be difficult to trace to jobs as they are completed. Why? Because actual direct-labor costs may include profit-based bonuses that are only known at the end of the year (a numerator reason). Also, the hours worked each period might vary significantly depending on the number of working days each month and the demand from clients (a denominator reason). To factor bonus payments in the calculation of the direct-labor cost rate, Lindsay may choose to use a twelve-month budgeted direct-cost rate rather than an actual direct-cost rate for assigning direct costs to individual jobs.²

An **extended normal costing** (also known as **budgeted costing**) method traces direct costs to a cost object by using the budgeted direct-cost rate(s) times the actual quantity of the direct-cost input and allocates indirect costs based on the budgeted indirect-cost rate(s) times the actual quantity of the cost-allocation base(s). The distinctive feature of extended normal costing is that it uses budgeted rates for both direct costs and indirect costs. Both these rates are calculated at the start of the accounting period.

The 19_8 budgeted direct-cost rate for Lindsay & Associates is computed as follows:

$$\begin{aligned}\text{Budgeted direct-labor cost rate} &= \frac{\text{Budgeted total direct-labor costs}}{\text{Budgeted total direct labor-hours to be billed}} \\ &= \frac{\$14,400,000}{288,000 \text{ hours}} = \$50 \text{ per hour} \\ &= \$50 \text{ per professional labor-hour}\end{aligned}$$

The chapter appendix discusses additional aspects of the budgeted direct labor cost rate calculations.

Under extended normal costing, the 19_8 cost of the Tracy Transport audit is \$76,000:

Direct job costs traced	
Professional labor, \$50 × 800	\$40,000
Indirect job costs allocated	
Audit support, \$45 × 800	36,000
	<u>\$76,000</u>

The Tracy Transport audit job is finished in March 19_8. Using extended normal costing, Lindsay can compute the \$76,000 amount once it knows that 800 professional labor-hours were actually worked on the Tracy audit. This information can be useful when bidding on future audits of Tracy Transport or other similar audits in April 19_8, May 19_8, and so on.

Exhibit 4-4 summarizes the three costing methods described in this chapter. The actual and budgeted rates in Exhibit 4-4 are developed at different points in

OBJECTIVE 4

Distinguish among actual costing, normal costing, and extended normal costing methods

²Alternatively, as many companies do, Lindsay could simply choose to consider those direct costs, such as bonuses determined only at year-end, as indirect costs to be allocated to jobs under a normal costing system.

EXHIBIT 4-4

Actual Costing, Normal Costing, and Extended Normal Costing Methods

PANEL A: GENERAL FORMULA

	Actual Costing	Normal Costing	Extended Normal Costing
Direct Costs	Actual direct-cost rate $\times$ Actual quantity of direct-cost input	Actual direct-cost rate $\times$ Actual quantity of direct-cost input	Budgeted direct-cost rate $\times$ Actual quantity of direct-cost input
Indirect Costs	Actual indirect-cost rate $\times$ Actual quantity of cost-allocation base	Budgeted indirect-cost rate $\times$ Actual quantity of cost-allocation base	Budgeted indirect-cost rate $\times$ Actual quantity of cost-allocation base

PANEL B: COSTING OF TRACY TRANSPORT AUDIT JOB

	Actual Costing	Normal Costing	Extended Normal Costing
Direct Costs	$\$51 \times 800 = \$40,800$	$\$51 \times 800 = \$40,800$	$\$50 \times 800 = \$40,000$
Indirect Costs	$\$47 \times 800 = \$37,600$	$\$45 \times 800 = \$36,000$	$\$45 \times 800 = \$36,000$
Total Costs	<u>$\\$78,400$</u>	<u>$\\$76,800$</u>	<u>$\\$76,000$</u>

time. Not surprisingly, they are not the same. For example, the rates used to cost the Tracy Transport audit in 19_8 are

	Actual Rates	Budgeted Rates
Direct-cost rate	\$51 per hour	\$50 per hour
Indirect-cost rate	\$47 per hour	\$45 per hour

In practice, costing systems will not always map neatly onto one of the three costing systems described in Exhibit 4-4. For example, an engineering consulting firm may have some actual direct costs traced to jobs as incurred (cost of making blueprints or fees paid to outside experts), other direct costs traced to jobs using a budgeted rate (professional labor costs), and indirect costs allocated to jobs using a budgeted rate (engineering and office support costs).

BROAD AVERAGING VIA PEANUT-BUTTER COSTING APPROACHES

The phrase **peanut-butter costing** describes a costing approach that uses broad averages to uniformly assign (spread or smooth out) the cost of resources to cost objects (such as products, services, or customers) when the individual products, services, or customers in fact use those resources in a nonuniform way.

OBJECTIVE 5

Explain undercosting and overcosting of products

Undercosting and Overcosting

Use of broad averages via a peanut-butter costing approach can lead to undercosting or overcosting of products (services, customers, and so on):

- ◆ **Product undercosting**—a product consumes a relatively high level of resources but is reported to have a relatively low total cost.
- ◆ **Product overcosting**—a product consumes a relatively low level of resources but is reported to have a relatively high total cost.