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Principles of Accounting

Volume 2

Managerial Accounting

Principles of Accounting, Volume 2: Managerial Accounting

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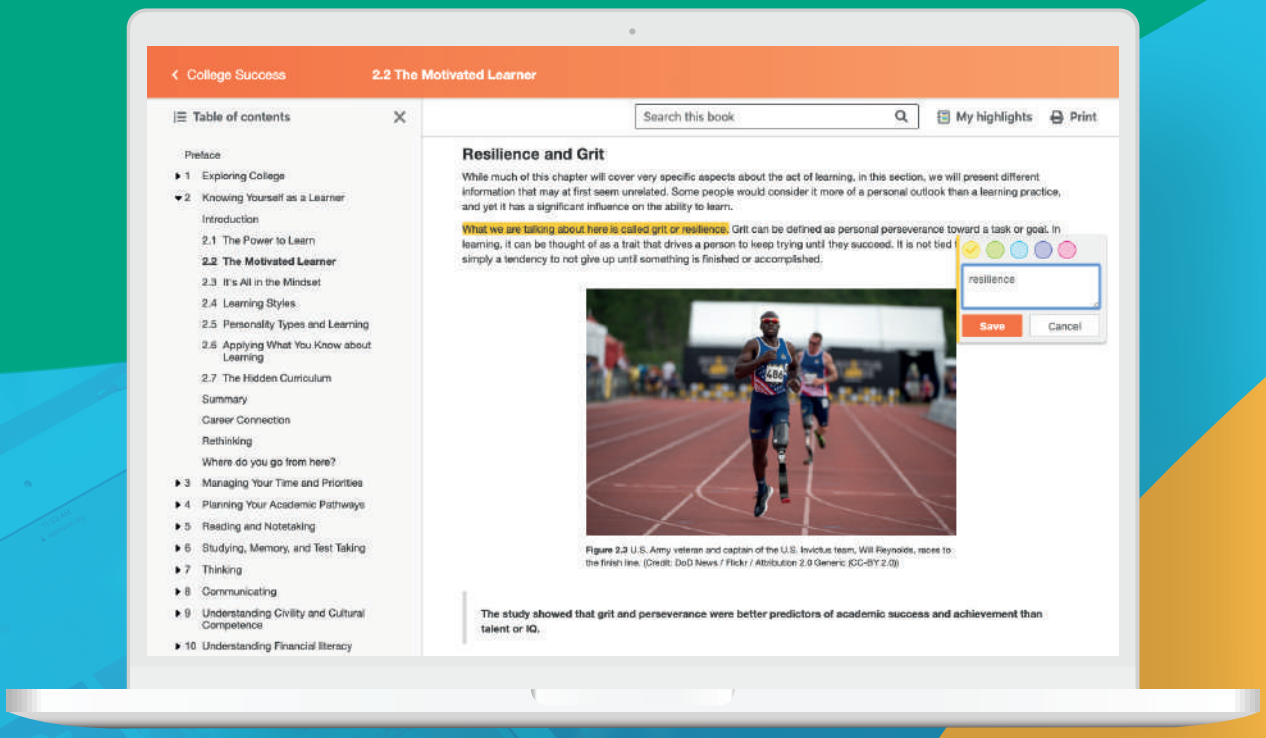

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TABLE OF CONTENTS

Preface

Welcome to *Principles of Accounting*, an OpenStax resource. This textbook was written to increase student access to high-quality learning materials, maintaining highest standards of academic rigor at little to no cost.

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Format

You can access this textbook for free in web view or PDF through openstax.org, and for a low cost in print.

About *Principles of Accounting*

Principles of Accounting is designed to meet the scope and sequence requirements of a two-semester accounting course that covers the fundamentals of financial and managerial accounting. This book is specifically designed to appeal to both accounting and non-accounting majors, exposing students to the core concepts of accounting in familiar ways to build a strong foundation that can be applied across business fields. Each chapter opens with a relatable real-life scenario for today's college student. Thoughtfully designed examples are presented throughout each chapter, allowing students to build on emerging accounting knowledge. Concepts are further reinforced through applicable connections to more detailed business processes. Students are immersed in the "why" as well as the "how" aspects of accounting in order to reinforce concepts and promote comprehension over rote memorization.

Coverage and scope

Our *Principles of Accounting* textbook adheres to the scope and sequence requirements of accounting courses nationwide. We have endeavored to make the core concepts and practical applications of accounting engaging, relevant, and accessible to students.

Principles of Accounting, Volume 1: Financial Accounting

Chapter 1: The Role of Accounting in Society

Chapter 2: Introduction to Financial Statements

Chapter 3: Analyzing and Recording Transactions

Chapter 4: The Adjustment Process

Chapter 5: Completing the Accounting Cycle

Chapter 6: Merchandising Transactions

Chapter 7: Accounting Information Systems

Chapter 8: Fraud, Internal Controls, and Cash

Chapter 9: Accounting for Receivables

Chapter 10: Inventory

Chapter 11: Long-Term Assets

Chapter 12: Current Liabilities

Chapter 13: Long-Term Liabilities

Chapter 14: Corporation Accounting

Chapter 15: Partnership Accounting

Chapter 16: Statement of Cash Flows

Principles of Accounting, Volume 2: Managerial Accounting

Chapter 1: Accounting as a Tool for Managers

Chapter 2: Building Blocks of Managerial Accounting

Chapter 3: Cost-Volume-Profit Analysis

Chapter 4: Job Order Costing

Chapter 5: Process Costing

Chapter 6: Activity-Based, Variable, and Absorption Costing

Chapter 7: Budgeting

Chapter 8: Standard Costs and Variances

Chapter 9: Responsibility Accounting and Decentralization

Chapter 10: Short-Term Decision-Making

Chapter 11: Capital Budgeting Decisions

Chapter 12: Balanced Scorecard and Other Performance Measures

Chapter 13: Sustainability Reporting

Engaging feature boxes

Throughout *Principles of Accounting*, you will find features that engage students by taking selected topics a step further.

- **Your Turn.** This feature provides students an opportunity to apply covered concepts.
- **Concepts in Practice.** This feature takes students beyond mechanics and illustrates the utility of a given concept for accountants and non-accountants. We encourage instructors to reference these as part of their in-class lectures and assessments to provide easily relatable applications.
- **Think It Through.** This scenario-based feature puts students in the role of decision-maker. With topics ranging from ethical dilemmas to conflicting analytical results, the purpose of this feature is to teach students that in the real world not every question has just one answer.
- **Continuing Application at Work.** This feature follows an individual company or segment of an industry and examines how businesspeople conduct the decision-making process in different situations. It allows students to see how concepts build on each other.
- **Ethical Considerations.** This feature illustrates the ethical implication of decisions, how accounting concepts are applied to real-life examples, and how financial and managerial decisions can impact many stakeholders.
- **IFRS Connection.** This feature presents the differences and similarities between U.S. GAAP and IFRS, helping students understand how accounting concepts and rules between countries may vary and thus affect financial reporting and decision-making.
- **Link to Learning.** This feature provides a very brief introduction to online resources and videos that are pertinent to students' exploration of the topic at hand.

Pedagogical features that reinforce key concepts

- **Learning Objectives.** Each chapter is organized into sections based on clear and comprehensive learning objectives that help guide students on what they can expect to learn. After completing the modules and assessments, students should be able to demonstrate mastery of the learning objectives.
- **Summaries.** Designed to support both students and instructors, section summaries distill the information in each module down to key, concise points.
- **Key Terms.** Key terms are bolded the first time that they are used and are followed by a definition in context. Definitions of key terms are also listed in the glossary, which appears at the end of the chapter.

Assessments to test comprehension and practice skills

An assortment of assessment types are provided in this text to allow for practice and self-assessment throughout the course of study.

- **Multiple Choice**. are basic review questions that test comprehension.
- **Questions** include brief, open-response questions to test comprehension.
- **Exercises** (Sets A and B) are application Application questions that require a combination of quantitative and analytical skills.
- **Problems** (Sets A and B) are advanced Advanced activities that allow students to demonstrate learning and application of multiple learning objectives and skills concurrently in one set of facts. Problems are designed to assess higher levels of Bloom's taxonomy.
- **Thought Provokers** are open-ended questions, often with more than one acceptable response, designed to stretch students intellectually.

Effective art program

Our art program is designed to enhance students' understanding of concepts through clear and effective presentations of financial materials and diagrams.

JOURNAL			
Date	**Account**	**Debit**	**Credit**
	Cost of Goods Sold Finished Goods Inventory *To record the cost of products sold*	25,000	25,000

Figure 1 Journal Entry.

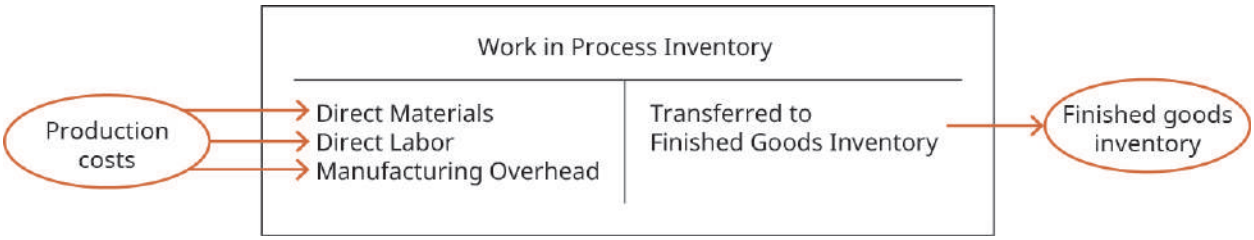


Figure 2 Work in Process Inventory T-Account.

WHICHARD & KLEIN, LLP
Income Statement
For the Year Ended December 31, 2019

Service Revenue	$412,000
Operating Expenses	
Salaries	210,000
Office Expense	35,000
Office Equipment	9,000
Administrative Salaries	45,000
Utilities	11,000
Miscellaneous	7,500
Total Operating Expenses	317,500
Operating Income	$ 94,500

Figure 3 Income Statement.

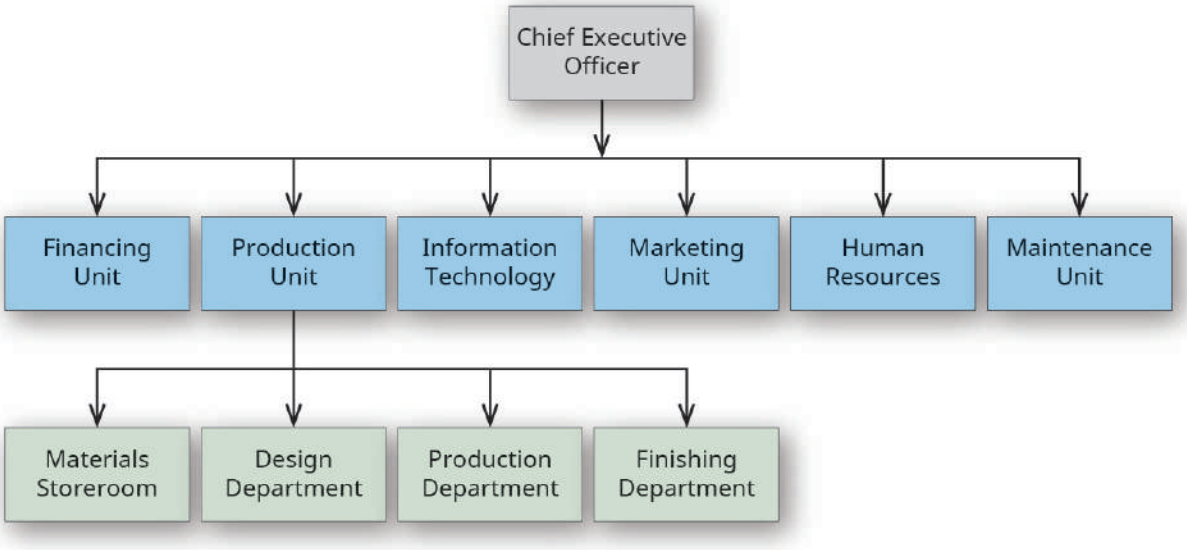
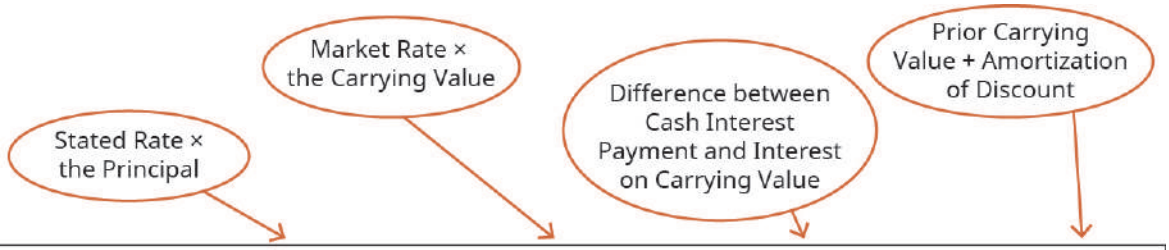


Figure 4 Organizational Chart.



Year	Cash Interest Payment	Interest on Carrying Value	Amortization of Discount	Carrying value
Jan. 1 Year 1				91,800
Dec. 31 Year 1	5,000	6,426	1,426	93,226
Dec. 31 Year 2	5,000	6,526	1,526	94,752
Dec. 31 Year 3	5,000	6,633	1,633	96,384
Dec. 31 Year 4	5,000	6,747	1,747	98,131
Dec. 31 Year 5	5,000	6,869	1,869	100,000

Figure 5 Cash Interest Payment.

GENERAL LEDGER					
Cash					Account No. 101
Date	Item	Ref.	Debit	Credit	Balance
2019					
Jan. 3	Cash for common stock		20,000		20,000
Jan. 9	Payment from client		4,000		24,000
Jan. 12	Utility bill			300	23,700
Jan. 14	Dividends payment			100	23,600
Jan. 17	Cash for services		2,800		26,400
Jan. 18	Paid cash for equipment			3,500	22,900
Jan. 20	Paid employee salaries			3,600	19,300
Jan. 23	Customer payment		5,500		24,800

Figure 6 General Ledger.

Additional resources

Student and instructor resources

We've compiled additional resources for both students and instructors, including Getting Started Guides, an instructor solution guide, and companion presentation slides. Instructor resources require a verified instructor account, which you can apply for when you log in or create your account on openstax.org. Instructor and student resources are typically available within a few months after the book's initial publication. Take advantage of these resources to supplement your OpenStax book.

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OpenStax partners with the Institute for the Study of Knowledge Management in Education (ISKME) to offer Community Hubs on OER Commons—a platform for instructors to share community-created resources that support OpenStax books, free of charge. Through our Community Hubs, instructors can upload their own materials or download resources to use in their own courses, including additional ancillaries, teaching material, multimedia, and relevant course content. We encourage instructors to join the hubs for the subjects

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Mitchell Franklin (PhD, CPA) is an Associate Professor and Director of the Undergraduate and Graduate Accounting Programs at Le Moyne College's Madden School of Business. His research interests include the impact of tax law on policy, and innovative education in both financial accounting and taxation, with articles published in journals including *Issues in Accounting Education, Advances in Accounting Education, Tax Notes, Journal of Taxation*, and *The CPA Journal and Tax Adviser*. He teaches introductory and advanced courses in individual and corporate taxation as well as financial accounting. Prior to joining Le Moyne College, he served on the faculty at Syracuse University.

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Patty Graybeal received her BBA from Radford University and her MACCT and PhD from Virginia Tech. She teaches undergraduate and graduate courses in financial, managerial, governmental, and international accounting. She has published scholarly articles on performance plans and compensation structures, as well as bankruptcy prediction, and she currently focuses on pedagogical issues related to instructional methods and resources that enhance student academic success. Prior to UM-Dearborn, she was on the faculty at Wake Forest University, George Mason University, and Virginia Tech. She brings significant real-world experience to the classroom from her prior work in healthcare administration and her current work with the auto industry.

Dixon Cooper, Ouachita Baptist University

Dixon Cooper received his BBA in Accounting and MS in Taxation from the University of North Texas. He has taught undergraduate and graduate courses in accounting, finance, and economics. In addition to his academic activities, he served for approximately fifteen years as an author/editor for the AICPA's continuing education program and maintained a tax compliance and financial services practice. He also has several years of experience in public accounting and consulting. Prior to teaching at Ouachita Baptist University, he was a faculty member at the University of North Texas, Texas Christian University Austin College, and the University of Arkansas.

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1

Accounting as a Tool for Managers

Figure 1.1 Business Honor Society Student Meeting. (credit: modification of "Group of People Sitting Near Table" by Christina Morillo/Pexels, Pexels license / Public Domain)

Chapter Outline

LO **1.1** Define Managerial Accounting and Identify the Three Primary Responsibilities of Management

LO **1.2** Distinguish between Financial and Managerial Accounting

LO **1.3** Explain the Primary Roles and Skills Required of Managerial Accountants

LO **1.4** Describe the Role of the Institute of Management Accountants and the Use of Ethical Standards

LO **1.5** Describe Trends in Today's Business Environment and Analyze Their Impact on Accounting

Why It Matters

You have been elected as the coordinator of committees for your school's business honor society. In essence, this makes you the manager of all the committees. This is a new position that was created because the committees have never been evaluated for their effectiveness within the organization. Your job in this position is to ensure that the committees—such as recruiting, fundraising, community service, professional activities, and regional and national conference presentations—are operating within the goals put forth in the society's mission statements, as well as to assess the effectiveness and efficiency of each committee in meeting the organization's goals. Your starting point is to understand the overriding mission—the strategic direction and purpose—of the society. Next, you want to understand how each committee fits into the strategic goal of the society and then identify the separate goals of each committee. Once you understand the purpose and goal of each committee, it will be necessary to know how each committee is going about meeting its goals. Last, you will evaluate each committee to see if the goals are being met.

Notice that in performing your role as the coordinator of committees, you will need financial information, such as budgets and financial statements, along with other nonfinancial information, for example, the society's

mission statement, each committee's strategy statement, and records of their activities and meetings. To help assess how well the honor society and its committees are meeting their goals, you need more information than can be obtained from simply looking at the various financial documents assembled by each committee within the organization. The same is true in any business organization. Managers and other internal decision makers need more information than is available in the basic financial statements: they need information generated by the managerial accounting system.

1.1 Define Managerial Accounting and Identify the Three Primary Responsibilities of Management

Financial accounting process provides a useful level of detail for external users, such as investors and creditors, but it does not provide enough detailed information for the types of decisions made in the day-to-day operation of the business or for the types of decisions that guide the company long term. **Managerial accounting** is the process that allows decision makers to set and evaluate business goals by determining what information they need to make a particular decision and how to analyze and communicate this information. Let's explore the role of managerial accounting in several different organizations and at different levels of the organization, and then examine the primary responsibilities of management.

Three friends who are recent graduates from business school, Alex, Hana, and Gillian, have each just begun their first postgraduation jobs. They meet for lunch and discuss what each of their jobs entails. Alex has taken a position as a market analyst for a Fortune 500 company that operates in the shipping industry. Her first assignment is to suggest and evaluate ways the company can increase the revenue from shipping contracts by 10 percent for the year. Before tackling this project, she has a number of questions. What is the purpose of this analysis? What type of information does she need? Where would she find this information? Can she get it from a basic income statement and balance sheet? How will she know if her suggestions for pricing are creating more shipping contracts and helping to meet the company's goal? She begins with an analysis of the company's top fifty customers, including the prices they pay, discounts offered, discounts applied, frequency of shipments, and so on, to determine if there are price adjustments that need to be made to attract those customers to use the company's shipping services more frequently.

Hana has a position in the human resources department of a pharmaceutical company and is asked to research and analyze a new trend in compensation in which employers are forgoing raises to employees and are instead giving large bonuses for meeting certain goals. Her task is to ascertain if this new idea would be appropriate for her company. Her questions are similar to Alex's. What information does she need? Where would she find this information? How would she determine the impact of this type of change on the business? If implemented, what information would she need to assess the success of the plan?

Gillian is working in the supply chain area of a major manufacturer that produces the various mirrors found on cars and trucks. Her first assignment is to determine whether it is more cost effective and efficient for her company to make or purchase a bracket used in the assembly of the mirrors. Her questions are also similar to her friends' questions. Why is the company considering this decision? What information does she need? Where would she find this information? Would choosing the option with the lowest cost be the correct choice?

The women are surprised by how similar their questions are despite how different their jobs are. They each are assigned tasks that require them to use various forms of information from many different sources to answer an important question for their respective companies. Table 1.1 provides possible answers to each of the questions posed in these scenarios.

Managerial Accounting and Various Business Roles

Questions	Possible Answers
Alex, Marketing Analyst	
What is the purpose of this analysis?	To determine a better way to price their services
What type of information does she need?	Financial and nonfinancial information, such as the number of contracts per client
Where would she find this information?	Financial statements, customer contracts, competitor information, and customer surveys
Can she get it from a basic income statement and balance sheet?	No, she would need to use many other sources of information
How will she know if her suggestions for pricing are creating more shipping contracts and helping to meet the company's goal?	By using a means to evaluate the success, such as by comparing the number of contracts received from each company before the new pricing structure with the number received after the pricing change of contracts
Hana, Human Resources	
What information does she need?	Financial and nonfinancial information, such as how other companies have implemented this idea, including the amount of the bonus and the types of measures on which the bonus was measured
Where would she find this information?	Mostly from internal company sources, such as employee performance records, but also from industry and competitor sources
How would she determine the impact of this type of change on the business?	Perform surveys to determine the effect of the bonus method on employee morale and employee turnover; she could determine the effect on gross revenue of annual bonuses versus annual raises
If implemented, what information would she need to assess the success of the plan?	Measuring employee turnover; evaluating employee satisfaction after the change; assessing whether the performance measures being used to determine the bonus were measures that truly impacted the company in a positive manner
Gillian, Supply Chain	
Why is the company considering this decision?	Management likely wants to minimize costs, and this particular part is one they believe may be more cost effective to buy than to make

Table 1.1

Managerial Accounting and Various Business Roles

Questions	Possible Answers
What information does she need?	She needs the cost to buy the part as well as all the costs that would be incurred to make the part; whether her company has the ability (capacity) to make the part; the quality of the part if they buy it compared to if they make it; the ability of a supplier of the part to deliver on time
Where would she find this information?	She would find the information from internal records about production costs, from cost details provided by the external producer, and from industry reports on the quality of production from the external supplier
Would choosing the option with the lowest cost be the correct choice?	The lowest-cost option may not be the best choice if the quality is subpar, if the part is not delivered in a timely manner and thus throws off or slows production, or if the use of a purchased part will affect the relationship between the company and the car manufacturer to whom the mirror is ultimately sold

Table 1.1

The questions the women have and the answers they require show that there are many types of information that a company needs to make business decisions. Although none of these individuals is given the title of manager, they need information to help provide management with the information necessary to make decisions to move the company forward with its strategic plan. The scenarios of the three women are not unique. These types of questions occur every day in businesses across the world.

Some decisions will be more clearly appropriate for higher-level management. For example, Lynx Boating Company produces three different lines of boats (sport boats, pontoon boats, and large cruisers). All three boat lines are profitable, but the pontoon boat line seems to be less profitable than the other two types of boats. Management may want to consider abandoning the pontoon line and using that additional capacity to produce one of the other more profitable lines. They would need detailed financial information in order to make such a decision.

LINK TO LEARNING

This short video goes inside a manufacturing process (https://openstax.org/l/50Manufacturing) to show you how machines, people, planning, implementation, efficiency, and costs interact to arrive at a finished product.

Service organizations also face decisions that require more detailed information than is available in financial accounting statements. A company's financial statements aggregate information for the company as a whole, but for most managerial decisions, information must be gathered in a timely manner at a product, customer, or division level. For example, the management of City Hospital is considering the purchase of four new magnetic resonance imaging (MRI) machines that scan three times faster than their current machines and thus would allow the hospital's imaging department to evaluate eight additional patients each day. Each

machine costs $425,000 and will last five years before needing to be replaced. Would this be a wise investment for City Hospital? Hospital management would need the appropriate information to assess the alternatives in order to make this decision. Throughout your study of managerial accounting, you will learn about the types of information needed to make these decisions, as well as techniques for analyzing this information. First, it is important to understand the various roles managers play in the organization in order to understand the types of information and the level of detail that are needed. Most of the job responsibilities of a manager fit into one of three categories: planning, controlling, or evaluating.

The model in Figure 1.2 sums up the three primary responsibilities of management and the managerial accountant's role in the process. As you can see from the model, the function of accomplishing an entity's mission statement is a circular, ongoing process.

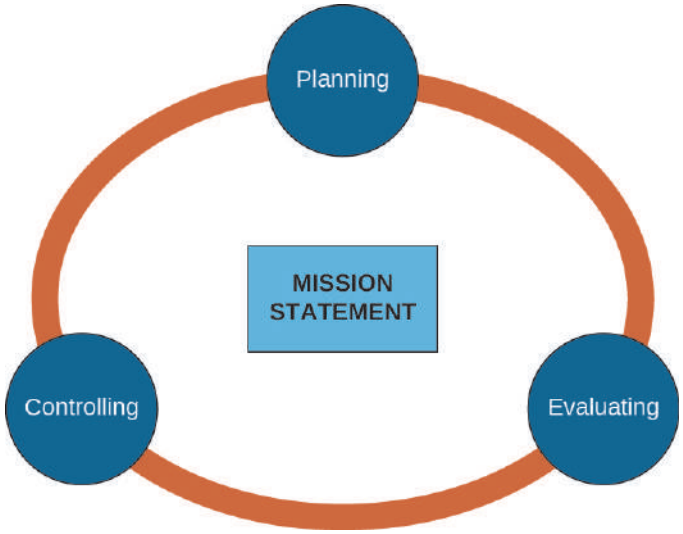


Figure 1.2 The Process of Adhering to the Mission Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Planning

One of the first items on a new company's agenda is the creation of a **mission statement**. A mission statement is a short statement of a company's purpose and focus. This statement should be broad enough that it will encompass future growth and changes of the company. Table 1.2 contains the mission statement of three different types of companies: a manufacturer, an e-commerce company, and a service company.

Sample Mission Statements

Company	Mission Statement
Dow Chemical	"To passionately create innovation for our stakeholders at the intersection of chemistry, biology, and physics."[1]
Starbucks	"To inspire and nurture the human spirit—one person, one cup, and one neighborhood at a time."[2]

Table 1.2

1 "Mission and Vision." DOW. https://www.dow.com/en-us/about-dow/our-company/mission-and-vision

Sample Mission Statements

Company	Mission Statement
Google	"Our mission is to organize the world's information and make it universally accessible and useful."[3]

Table 1.2

Once the mission of the company has been determined, the company can begin the process of setting **goals**, or what the company expects to accomplish over time, and **objectives**, or the targets that need to be met in order to meet the company's goals. This is known as **planning**. Planning occurs at all levels of an organization and can cover various periods of time. One type of planning, called **strategic planning**, involves setting priorities and determining how to allocate corporate resources to help an organization accomplish both short-term and long-term goals. For example, one hotel may want to be the low-price, no-frills, clean alternative, while another may decide to be the superior quality, high-price luxury hotel with many amenities. Obviously, to be successful, either of these businesses must determine the goals necessary to meet their particular strategy.

Typically, a strategic plan will span any number of years an organization chooses (three, five, seven, or even ten years), and often companies will have multiple strategic plans, such as one for three years, one for five years, and one for ten years. Given the time length involved in many plans, the organization also needs to factor in the potential effects of changes in their senior executive leadership and the composition of the board of directors.

What types of objectives are part of a strategic plan? Strategic objectives should be diverse and will vary from company to company and from industry to industry, but some general goals can include maximizing market share, increasing short-term profits, increasing innovation, offering the best value for the cost, maintaining commitment to community programs, and exceeding environmental protection mandates.

From a managerial accounting perspective, planning involves determining steps or actions to meet the strategic or other goals of the company. For example, Daryn's Dairy, a major producer of organic dairy products in the Midwest, has made increasing the market share of its products one of its strategic goals. However, to be truly effective, the goals need to be defined specifically. For example, the goals might be stated in terms of percentage growth, both annually and in terms of the number of markets addressed in their growth projections.

Also, Daryn's planning process would include the steps the company plans to use to implement to increase market share. These plans may include current-year plans, five-year plans, and ten-year plans.

The current-year plan may be to sell the company's products in 10 percent more stores in the states in which it currently operates. The five-year plan may be to sell the products internationally in three countries, and the ten-year plan may be to acquire their chief competitor and, thus, their customers. Each of these plans will require outlining specific steps to reach these goals and communicating those steps to the employees who will carry out or have an impact on reaching these goals and implementing these plans.

Planning can involve financial and nonfinancial processes and measures. One planning tool discussed in Budgeting is the budgeting process, which requires management to assess the resources—for example, time,

2 "Our Starbucks Mission Statement." Starbucks. https://www.starbucks.com/about-us/company-information/mission-statement
3 "About." Google. https://www.google.com/about/

money, and number and type of employees needed—to meet current-year objectives. Budgeting often includes both financial data, such as worker pay rates, and nonfinancial data, such as the number of customers an employee can serve in a given time period.

A retail company can plan for the expected sales volume, a hospital can plan for the number of x-rays they expect to administer, a law firm can plan the hours expected for the various types of legal services they perform, a manufacturing firm can plan for the level of quality expected in each item produced, and a utility company can plan for the level of air pollutants that are acceptable. Notice that in each of these examples, the aspect of the business that is being planned and evaluated is a qualitative (nonfinancial) factor or characteristic. In your study of managerial accounting, you will learn about many situations in which both financial and nonfinancial data or information are equally relevant. However, the qualitative aspects are typically not quantified in dollars but evaluated using some other standards, such as customers served or students advised.

While these functions are initially stated in qualitative terms, most of these items would at some point be translated into a dollar value or dollar effect. In each of these examples, the managerial accounting function would help to determine the variables that would help appropriately measure the desired goal as well as plan how to quantify these measures. However, measures are only useful if tracked and used to determine their effectiveness. This is known as the control function of management.

Controlling

To measure whether plans are meeting objectives or goals, management must put in place ways to assess success or lack of success. **Controlling** involves the monitoring of the planning objectives that were put into place. For example, if you have a retail store and you have a plan to minimize shoplifting, you can implement a control, such as antitheft tags that trigger an alarm when someone removes them from the store. You could also install in the ceilings cameras that provide a different view of customers shopping and therefore may catch a thief more easily or clearly. The antitheft tags and cameras serve as your controls against shoplifting.

Managerial accounting is a useful tool in the management control function. Managerial accounting helps determine the appropriate controls for measuring the success of a plan. There are many types of controls that a company can use. Some controls can be in the form of financial measures, such as the ratio for inventory turnover, which is a measure of inventory control and is defined as Cost of Goods Sold ÷ Average Inventory, or in the form of a performance measure, such as decreasing production costs by 10 percent to help guide or control the decisions made by managers. Other controls can be physical controls, such as fingerprint identification or password protection. Essentially, the controlling function in management involves helping to coordinate the day-to-day activities of a business so that these activities lead to meeting corporate goals.

Without controls, it is very unlikely a plan would be successful, and it would be difficult to know if your plan was a success. Consider the plan by Daryn's Dairy to increase market share. The plan for the first year was to increase market share by selling the company's products in 10 percent more stores in the states in which the company already operates. How will the company implement this plan? The implementation, or carrying out, of the plan will require the company to put controls in place to measure which new stores are successfully selling the company's products, which products are being sold the most, what the sales volume and dollar value of the new stores are, and whether the sales in these new stores are affecting the volume of sales in current stores. Without this information, the company would not know if the plan is reaching the desired result of increased market share.

The control function helps to determine the courses of action that are taken in the implementation of a plan by

helping to define and administer the steps of the plan. Essentially, the control function facilitates coordination of the plan within the organization. It is through the system of controls that the actual results of decisions made in implementing a plan can be identified and measured. Managerial accounting not only helps to determine and design control measures, it also assists by providing performance reports and control reports that focus on variances between the planned objective performance and the actual performance. Control is achieved through effective feedback, or information that is used to assess a process. Feedback allows management to evaluate the results, determine whether progress is being made, or determine whether corrective measures need to be taken. This evaluation is in the next management function.

Evaluating

Managers must ultimately determine whether the company has met the goals set in the planning phase. **Evaluating**, also called *assessing* or *analyzing*, involves comparing actual results against expected results, and it can occur at the product, department, division, and company levels. When there are deviations from the stated objectives, managers must decide what modifications are needed.

The controls that were put into place to coordinate the implementation of a particular company plan must be evaluated so that success can be measured, or corrective action can be taken. Consider Daryn's Dairy's one-year plan to increase market share by selling products in 10 percent more stores in the states in which the company currently operates. Suppose one of the controls put into place is to measure the sales in the current stores to determine if selling the company's products in new stores is adding new sales or merely moving sales from existing stores. This control measure, same-store sales, must be evaluated to determine the effect of the decision to expand the selling of products within the state. This control measure will be evaluated by comparing sales in the current year in those stores to sales from the prior year in those same stores. The results of this evaluation will help guide management in their decision to move forward with their plan, to modify the plan, or to scrap the plan.

As discussed previously, not all evaluations will involve quantitative or financial measures. In expanding market share, the company wants to maintain or improve its reputation with customers and does not want the planned increased availability or easier access to their products to decrease customer perceptions of the products or the company. They could use customer surveys to evaluate the perceived effect on the company's reputation as a result of implementing this one-year plan. However, there are many ways that companies can evaluate various controls. In addition to the financial gauges, organizations are now measuring efficiencies, customer development, employee retention, and sustainability.

Managers spend their time in various stages of planning, controlling, and evaluating. Generally, higher-level managers spend more time on planning, whereas lower-level managers spend more time on evaluating. At any level, managers work closely with the managerial accounting team to help in each of these stages. Managerial accountants help determine whether plans are measurable, what controls should be implemented to carry out a plan, and what are the proper means of evaluation of those controls. This would include the type of feedback necessary for management to assess the results of their plans and actions. Management accountants generate the reports and information needed to assess the results of the various evaluations, and they help interpret the results.

To put this in context, think about how you will spend your weekend. First, you are the manager of your own time. You must plan based on your workload and on how much time you will spend studying, exercising, sleeping, and meeting with friends. You then control how your plan is implemented by setting self-imposed or possibly group meeting–imposed deadlines, and last, you evaluate how well you carried out your plan by

gathering more data—such as grades on assignments, personal fulfillment, and number of hours of sleep—to determine if you met your plans (goals). Not planning, controlling, and evaluating often results in less-than-desirable outcomes, such as late assignments, too little sleep, or bad grades. In this scenario, you did not need a separate managerial accountant to help you with these functions, because you could manage planning, controlling, and evaluating on your own. However, in the business world, most businesses will have both managers and managerial accountants. Table 1.3 illustrates some examples.

Relating Managerial Accounting Functions to Various Business Majors

	Sales	Human Resources	Logistics
Planning	What are our expected sales for each product in each geographic region? How much should be budgeted for salaries and commissions for our salespeople?	How much should we budget for salary and wage increases for the year? How much should we plan to spend on safety and training for the year?	Should we invest in radio-frequency identification (RFID) processors to enable computer tracking of inventory? How much raw material should be ordered and delivered to ensure timely delivery of our finished products to our customers?
Controlling	Are we meeting expected sales growth in each region? Are each of the salespeople meeting their sales projections?	Is our projected budget for wages and salaries sufficient? Are we meeting our safety and training goals?	Are our products being delivered to our customers in a timely manner, and at what cost? Are we dealing with stock-outs in inventory? If so, what is that costing us?
Evaluating	How do our actual sales compare to our forecasted or budgeted sales? What sales promotions are our competitors offering, and what effect is it having on our market share?	Would it be cheaper to hire temporary employees to get through our “busy” season or to pay our current employees for overtime?	What are the cost differences in starting our own delivery service versus continuing to use other carriers? Should we outsource the manufacturing of a component part or continue to make it ourselves? What are the price differences?

Table 1.3

YOUR TURN

Evaluating On-Campus versus Off-Campus Living

The principal purpose of managerial accounting is to deliver information useful for management decision-making. Many of the techniques used in managerial accounting are useful for decisions in your everyday life. In choosing whether to live on campus or off campus, how might you use planning, controlling, and evaluating in your decision-making process? What types of financial and nonfinancial information might you need?

Solution

Planning:

- Creating a list of financial and nonfinancial goals to be accomplished in your next year in college
- Determining how much each alternative will cost, including utilities, food, and transportation, and creating a budget

Controlling:

- Using an expense recording app to monitor your expenses
- Monitoring the effectiveness of your study time as reflected in your grades
- Monitoring your physical health to measure if your living arrangements are conducive to staying healthy

Evaluating:

- Assessing the effectiveness of your living arrangements by measuring your grades, bank account, and general happiness

Financial:

- Cost of staying in dorm versus the cost of an apartment or house
- Estimate of differences in other costs, such as utilities, food, and additional transportation

Nonfinancial:

- Convenience of location of dorm versus apartment or house
- Quality of living experience including number of roommates, ability to have own room, study environment differences
- Length of rental term of dorm versus apartment or house
- Where you plan to live in the summer, what you plan to do during that time

THINK IT THROUGH

US Small Business Administration

Many students who study managerial accounting will work for a small business, and some may even own a small business. In order to operate a small business, you need an understanding of managerial

accounting, among other skills. The US Small Business Administration is an agency within the federal government that has the sole purpose of supporting small businesses. You can find a plethora of information on their website, https://www.sba.gov/.

1. What are some of the steps in creating a small business?
2. What are the top ten reasons given for a business failure?
3. How could an understanding of managerial accounting help a small business owner?

1.2 Distinguish between Financial and Managerial Accounting

Now that you have a basic understanding of managerial accounting, consider how it is similar to and different from financial accounting. After completing a financial accounting class, many students do not look forward to another semester of debits, credits, and journal entries. Thankfully, managerial accounting is much different from financial accounting. Also known as *management accounting* or *cost accounting*, managerial accounting provides information to managers and other users within the company in order to make more informed decisions. The overriding roles of managers (planning, controlling, and evaluating) lead to the distinction between financial and managerial accounting. The main objective of management accounting is to provide useful information to managers to assist them in the planning, controlling, and evaluating roles.

Unlike managerial accounting, financial accounting is governed by rules set out by the **Financial Accounting Standards Board (FASB)**, an independent board made up of accounting professionals who determine and publicize the standards of financial accounting and reporting in the United States. Larger, publicly traded companies are also governed by the US Securities and Exchange Commission (SEC), in the form of the **generally accepted accounting principles (GAAP)**, the common set of rules, standards, and procedures that publicly traded companies must follow when they are composing their financial statements.

Financial accounting provides information to enable stockholders, creditors, and other stakeholders to make informed decisions. This information can be used to evaluate and make decisions for an individual company or to compare two or more companies. However, the information provided by financial accounting is primarily historical and therefore is not sufficient and is often synthesized too late to be overly useful to management. Managerial accounting has a more specific focus, and the information is more detailed and timelier. Managerial accounting is not governed by GAAP, so there is unending flexibility in the types of reports and information gathered. Managerial accountants regularly calculate and manage “what-if” scenarios to help managers make decisions and plan for future business needs. Thus, managerial accounting focuses more on the future, while financial accounting focuses on reporting what has already happened. In addition, managerial accounting uses nonfinancial data, whereas financial accounting relies solely on financial data.

For example, Daryn’s Dairy makes many different organic dairy products. Daryn’s managers need to track their costs for certain jobs. One of the company’s top-selling ice creams is their seasonal variety; a new flavor is introduced every three months and sold for only a six-month period. The cost of these specialty ice creams is different from the cost of the standard flavors for reasons such as the unique or expensive ingredients and the specialty packaging. Daryn wants to compare the costs involved in making the specialty ice cream and those involved in making the standard flavors of ice cream. This analysis will require that Daryn track not only the cost of materials that go into the product, but also the labor hours and cost of the labor, plus other costs, known as overhead costs (rent, electricity, insurance, etc.), that are incurred in producing the various ice creams. Once the total costs for both the specialty ice cream and the standard flavored ice cream are known, the cost per unit can be determined for each type. These types of analyses help a company evaluate how to set

pricing, evaluate the need for new or substitute ingredients, manage product additions and deletions, and make many other decisions. Figure 1.3 shows an example of a materials cost analysis by Daryn's Dairy used to compare the materials cost for producing 500 gallons of their best-selling standard flavor—vanilla—with one of their specialty ice creams—Very Berry Biscotti.

	STANDARD VANILLA ICE CREAM (500-gallon batch)			SPECIALTY BERRY BISCOTTI ICE CREAM (500-gallon batch)		
Ingredients	Quantity	Total Cost	Per Gallon Cost	Quantity	Total Cost	Per Gallon Cost
Cream	140 gal	$500	$1.00	160 gal	$500	$1.00
Milk	312 gal	250	0.50	300 gal	250	0.50
Sugar	750 lbs	200	0.40	725 lbs	200	0.40
Vanilla flavoring	3.25 gal	150	0.30	3.25 gal	150	0.30
Vanilla beans	200 lbs	300	0.60			
Berries				500 lbs	400	0.80
Biscotti crumbles				250 lbs	275	0.55
Total		$1,400	$2.80		$1,775	$3.55

Figure 1.3 Material Cost Analysis. Daryn's Dairy materials cost comparison analysis between best-selling standard vanilla ice cream and Very Berry Biscotti, a limited-edition specialty ice cream. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Financial and Managerial Accounting Comparative

Managerial and financial accounting are used by every business, and there are important differences in their reporting functions. Those differences are detailed in Figure 1.4.

COMMUNICATION THROUGH REPORTING	FINANCIAL ACCOUNTING	MANAGERIAL ACCOUNTING
Users of reports	External users: stockholders, creditors, regulators	Internal users: managers, officers, and other employees
Types of reports	Financial statements: balance sheet, income statement, cash-flow statement, etc.	Internal reports: job cost sheet, cost of goods manufactured, production cost report, etc.
Frequency of reports	Quarterly; annually	As frequently as needed
Purpose of reports	Helps those external users make decisions: credit terms, investment, and other decisions	Assists the internal users in the planning and control decision-making process
Focus of reports	Pertains to company as a whole Uses GAAP structure Composed from a multitude or combination of other more individual data	Pertains to departments, sections of the business Very detailed reporting No GAAP constraints
Nature of reports	Monetary	Monetary and nonmonetary information
Verification of reports	Audited by CPA	No independent audits

Figure 1.4 Comparing Reports between Financial and Managerial Accounting. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Users of Reports

The information generated from the reports of financial accountants tends to be used primarily by **external users**, including the creditors, tax authorities and regulators, investors, customers, competitors, and others outside the company, who rely on the financial statements and annual reports to access information about a company in order to make more informed decisions. Since these external people do not have access to the documents and records used to produce the financial statements, they depend on Generally Applied Accounting Principles (GAAP). These outside users also depend greatly on the preparation of audits that are done by public accounting firms, under the guidelines and standards of either the American Institute of Certified Public Accountants (AICPA), the US Securities and Exchange Commission (SEC), or the Public Company Accounting Oversight Board (PCAOB).

Managerial accounting information is gathered and reported for a more specific purpose for **internal users**, those inside the company or organization who are responsible for managing the company's business interests and executing decisions. These internal users may include management at all levels in all departments, owners, and other employees. For example, in the budget development process, a company such as Tesla may want to project the costs of producing a new line of automobiles. The managerial accountants could create a budget to estimate the costs, such as parts and labor, and after the manufacturing process has begun, they can measure the actual costs, thus determining if they are over or under their budgeted amounts. Although

outside parties might be interested in this information, companies like Tesla, Microsoft, and Boeing spend significant amounts of time and money to keep their proprietary information secret. Therefore, these internal budget reports are only available to the appropriate users. While you can find a cost of goods sold schedule in the financial statements of publicly traded companies, it is difficult for outside parties to break it down in order to identify the individual costs of products and services.

LINK TO LEARNING

Investopedia is considered to be the largest Internet financial education resource in the world. There are many short, helpful videos that explain various concepts of managerial accounting. Watch this video explaining managerial accounting and how useful it can be to many different types of managers (https://openstax.org/l/50ManageAccount) to learn more.

Types of Reports

Financial accounting information is communicated through reporting, such as the financial statements. The financial statements typically include a balance sheet, income statement, cash flow statement, retained earnings statement, and footnotes. Managerial accounting information is communicated through reporting as well. However, the reports are more detailed and more specific and can be customized. One example of a managerial accounting report is a budget analysis (variance report) as shown in Figure 1.5. Other reports can include cost of goods manufactured, job order cost sheets, and production reports. Since managerial accounting is not governed by GAAP or other constraints, it is important for the creator of the reports to disclose all assumptions used to make the report. Since the reports are used internally, and not typically released to the general public, the presentation of any assumptions does not have to follow any industry-wide guidelines. Each organization is free to structure its reports in the format that organizes its information in the best way for it.

BUDGET ANALYSIS			
	Actual	Budgeted	Variance
Sales	$ 500,000	$ 490,000	$ 10,000
Cost of Goods Sold	(320,000)	(290,000)	(30,000)
Gross Margin	180,000	200,000	(20,000)
Selling & Administrative Expenses	(75,000)	(90,000)	15,000
Net Income	105,000	110,000	(5,000)

Figure 1.5 Example of a Budget (Variance) Analysis. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

This type of analysis helps management to evaluate how effective they were at carrying out the plans and meeting the goals of the corporation. You will see many examples of reports and analyses that can be used as tools to help management make decisions.

THINK IT THROUGH

Projection Error

You are working as the accountant in the special projects and budgets area of Sturm, Ruger & Company, a law firm that currently specializes in bankruptcy law. In order to serve their customers better and more efficiently, the company is trying to decide whether or not to expand its services and offer credit counseling, credit monitoring, credit rebuilding, and identity protection services. The president comes to you and asks for some sales and revenue projections. He would like the projections in three days' time so that he can present the results to the board at the annual meeting.

You work tirelessly for two straight days compiling projections of sales and revenues to prepare the reports. The report is provided to the president just before the board is to arrive.

When you return to your office, you start clearing away some of the materials that you used in your report, and you discover an error that makes all of your projections significantly overstated. You ask the president's administrative assistant if the president has presented the report to the board, and you find that he had mentioned it but not given the full report as of yet.

What would you do?

- What are the ethical concerns in this matter?
- What would be the results of telling the president of your error?
- What would be the results of *not* telling the president of your error?

Frequency of Reports

The financial statements are typically generated quarterly and annually, although some entities also require monthly statements. Much work is involved in creating the financial statements, and any adjustments to accounts must be made before the statements can be produced. A physical count inventory must be done to adjust the inventory and cost of goods sold accounts, depreciation must be calculated and entered, all prepaid asset accounts must be reviewed for adjustments, and so forth. The annual reports are not finalized for several weeks after the year-end, because they are based on historical data; for a company that is traded on one of the major or regional stock exchanges, it must have an audit of the financial statements conducted by an independent certified public accountant. This audit cannot be completed until after the end of the company's fiscal year, because the auditors need access to all of the information for the company for that year. For companies that are privately held, an audit is not normally required. However, potential lenders might require an independent audit.

Conversely, managers can quickly attain managerial accounting information. No external, independent auditors are needed, and it is not necessary to wait until the year-end. Projections and estimates are adequate. Managers should understand that in order to obtain information quickly, they must accept less precision in the reporting. While there are several reports that are created on a regular basis (e.g., budgets and variance reports), many management reports are produced on an as-needed basis.

Purpose of Reports

The general purpose of financial statement reporting is to provide information about the results of operations,

financial position, and cash flows of an organization. This data is useful to a wide range of users in order to make economic decisions. The purpose of the reporting done by management accountants is more specific to internal users. Management accountants make available the information that could assist companies in increasing their performance and profitability. Unlike financial reports, management reporting centers on components of the business. By dividing the business into smaller sections, a company is able to get into the details and analyze the smallest segments of the business.

An understanding of managerial accounting will assist anyone in the business world in determining and understanding product costs, analyzing break-even points, and budgeting for expenses and future growth (which will be covered in other parts of this course). As a manager, chief executive officer, or owner, you need to have information available at hand to answer these types of questions:

- Are my profits higher this quarter over last quarter?
- Do I have enough cash flow to pay my employees?
- Are my jobs priced correctly?
- Are my products priced correctly in order for me to make the profit I need to make?
- Who are my most productive and least productive employees?

In the world of business, information is power; stated simply, the more you know, typically, the better your decisions can be. Managerial accounting delivers data-driven feedback for these decisions that can assist in improving decision-making over the long term. Business managers can leverage this powerful tool in order to make their businesses more successful, because management accounting adds value to common business decision-making. All of this readily available information can lead to great improvements for any business.

Focus of Reports

Because financial accounting typically focuses on the company as a whole, external users of this information choose to invest or loan money to the entire company, not to a department or division within the company. Therefore, the global focus of financial accounting is understandable.

However, the focus of management accounting is typically different. Managerial reporting is more focused on divisions, departments, or any component of a business, down to individuals. The mid-level and lower-level managers are typically responsible for smaller subsets within the company.

Managers need accounting reports that deal specifically with their division and their specific activities. For instance, production managers are responsible for their specific area and the results within their division. Accordingly, these production managers need information about results achieved in their division, as well as individual results of departments within the division. The company can be broken into segments based on what managers need—for example, geographic location, product line, customer demographics (e.g., gender, age, race), or any of a variety of other divisions.

Nature of Reports

Both financial reports and managerial reports use **monetary accounting information**, or information relating to money or currency. Financial reports use data from the accounting system that is gathered from the reporting of transactions in the form of journal entries and then aggregated into financial statements. This information is monetary in nature. Managerial accounting uses some of the same financial information as financial accounting, but much of that information will be broken down to a more detailed level. For example, in financial reporting, net sales are needed for the income statement. In managerial accounting, the quantity and dollar value of the sales of each product are likely more useful. In addition, managerial accounting uses a

significant amount of **nonmonetary accounting information**, such as quantity of material, number of employees, number of hours worked, and so forth, which does not relate to money or currency.

Verification of Reports

Financial reports rely on structure. They are generated using accepted principles that are enforced through a vast set of rules and guidelines, also known as GAAP. As mentioned previously, companies that are publicly traded are required to have their financial statements audited on an annual basis, and companies that are not publicly traded also may be required to have their financial statements audited by their creditors. The information generated by the management accountants is intended for internal use by the company's divisions, departments, or both. There are no rules, guidelines, or principles to follow. Managerial accounting is much more flexible, so the design of the managerial accounting system is difficult to standardize, and standardization is unnecessary. It depends on the nature of the industry. Different companies (even different managers within the same company) require different information. The most important issue is whether the reporting is useful for the planning, controlling, and evaluation purposes.

YOUR TURN

Daryn's Dairy

Figure 1.6 Assorted Ice Cream Flavors. (credit: "Assorted Ice Creams" by "jeshoots"/Pexel, CC0)

Suppose you have been hired by Daryn's Dairy as a market analyst. Your first assignment is to evaluate the sales of various standard and specialty ice creams within the Midwest region where Daryn's Dairy operates. You also need to determine the best-selling flavors of ice cream in other regions of the United States as well as the selling patterns of the flavors. For example, do some flavors sell better than others at different times of the year, or are some top sellers sold as limited-edition flavors? Remember that one of the strategic goals of the company is to increase market share, and the first step in meeting this goal is to sell their product in 10 percent more stores within their current market, so your research will help upper-level management carry out the company's goals. Where would you gather the information? What type of information would you need? Where would you find this information? How would the company determine the impact of this type of change on the business? If implemented, what information would

you need to assess the success of the plan?

Solution

Answers will vary. Sample answer:

Where would you gather the information? Where would you find this information?

- Current company sales information would be obtained from internal company reports and records that detail the sale of each type of ice cream including volume, cost, price, and profit per flavor.
- Sales of ice cream from other companies may be more difficult to obtain, but the footnotes and supplemental information to the annual reports of those companies being analyzed, as well as industry trade journals, would likely be good sources of information.

What types of information would you need?

- Some of the types of information that would be needed would be the volume of sales of each flavor (number of gallons), how long each flavor has been sold, whether seasonal or limited-edition flavors are produced and sold only once or are on a rotating basis, the size of the market being examined (number of households), whether the other companies sell similar products (organic, all natural, etc.), the median income of consumers or other information to assess the consumers' willingness to pay for organic products, and so forth.

How would Daryn's Dairy determine the impact of this type of change on the business?

- Management would evaluate the cost to expand into new stores in their current market compared to the potential revenues from selling their products in those stores in order to assess the ability of the potential expansion to generate a profit for the company.

If implemented, what information would Daryn's Dairy need to assess the success of the plan?

- Management would measure the profitability of selling any new products, expanding into new stores in their current market, or both to determine if the implementation of the plan was a success. If the plan is a success and the company is generating profits, the company will continue to figure out ways to improve efficiency and profitability. If the plan is not a success, the company will determine the reasons (cost to produce too high, sales price too high, volume too low, etc.) and make a new plan.

1.3 Explain the Primary Roles and Skills Required of Managerial Accountants

It is clear that management accountants must have a solid foundation in accounting, in both financial and managerial accounting, but other than accounting skills, what makes good managerial accountants?

- They must have knowledge of the business in which they are working. **Commercial awareness** is knowing how a business is run and how it is influenced by the external environment and knowing and understanding the overall industry within which the business is operating.
- **Collaboration**, which involves working in cross-functional teams and earning the trust and respect of colleagues in order to complete a task, is vital to improving managerial accounting talents. They should be "team players."
- Management accountants should have **effective communication** skills that allow them to convey

accounting information in both written and oral forms in a way that the intended audience can understand. Being able to gather the data quickly and accurately is important, but the data is meaningless if it is not presented in an intuitive style that the audience can understand.

- Strong technology skills are also essential. These skills include not only accounting and reporting software but also other programs that would assist in automating processes, improving efficiencies, and adding value to the company. For many companies, additional software and accompanying technology are often needed for both their financial and managerial accounting functions. For example, *enterprise resource planning* (ERP) systems often play a major role in the creation of comprehensive accounting systems. This additional support is often provided by outside suppliers such as Hyperion, Cognos, Sage, SAP, PeopleSoft, and Oracle.
- Managerial accountants must possess extensive analytical skills. They must regularly work with financial analysts and management personnel to find ways to reduce expenses and analyze budgets. These skills include the ability to envision, verbalize, conceptualize, or solve both multifaceted and simplistic problems by making choices that make sense with the given information.
- Managerial accountants must have ethics and values. They should be an example to others and encourage them to follow internal control practices and procedures. Ethics is discussed in more detail in Describe the role of the Institute of Management Accountants and the use of ethical standards.

Managers at all levels make many different types of decisions every day, but to make most decisions, they need specific information. Some information is easily obtainable, and some is not. Managers do not always know what information they need or what is available, and they need to know if the decisions they make are having the desired outcome and meeting specific goals.

To this point, we've described *managerial accounting* as a process. The following definition considers it a profession. Management accountants are the individuals who help management with this information. The Institute of Management Accountants (IMA) defines management accounting as "a profession that involves partnering in management decision making, devising planning and performance management systems, and providing expertise in financial reporting and control to assist management in the formulation and implementation of an organization's strategy."[4]

The IMA also reports that nearly 75 percent of financial professionals work in business as management accountants in positions such as financial analysts, accounting managers, controllers, and chief financial officers.[5] These professionals have a significant impact on businesses through influencing the decision-making process and business strategy.

Management accountants work at various levels of the organization, from the project level to the division level to the controller and chief financial officer. Often, management accountants work where they are needed and not necessarily at corporate headquarters. They tend to be hands-on in the decision-making process. They need many types of information to inform the many decisions they must make.

4 "Management Accounting Careers." Institute of Management Accountants. https://www.imanet.org/students/management-accounting-careers?ssopc=1

5 "Management Accounting Careers." Institute of Management Accountants. https://www.imanet.org/students/management-accounting-careers?ssopc=1

CONTINUING APPLICATION AT WORK

Who Uses Managerial Accounting?

When most people think of an accounting job, they think of someone who does taxes or who puts together financial statements. However, almost all jobs use accounting information, particularly managerial accounting information. Table 1.4 shows how certain professions might use managerial accounting information. Can you think of other examples?

Use of Managerial Accounting Information

Profession	How They Use Managerial Accounting in Their Industry
Engineer	Properly track and report the use of resources involved in an engineering project; measure and communicate costs of a project and its outcomes
Mayor	Put together a budget, a planning and control mechanism that plays an important role in every government
Nurse	Track operating or service costing per patient, or per unit
Mechanic	Use job costing to figure total costs and overall profitability on each job
Retail store manager	Forecast inventory needs, review profit margins, and track sales margins on individual products as well as entire stores
Restaurant owner	Calculate the cost of serving a single table by estimating the cost of the food plus time of server, keep food costs under control through inventory tracking
Architect	Track direct and indirect costs for each job; track profitability per job
Farmer	Calculate yields per field, analyze fertilizer and seeding rates, and control waste

Table 1.4

Organizational Structure

Most companies have an organizational chart that displays the configuration and the delegation of authority in the decision-making processes (Figure 1.7). The structure helps define roles and responsibilities. The organizational charts provide guidance to employees and other stakeholders by outlining the official reporting affiliations that direct the workflow within the organization. If the company is particularly efficient, it also will include contact information within the chart. This is a convenient directory to circulate among employees. It helps them find a particular person in a certain position, or determine whom to speak to about certain areas within the company, or even identify a specific person's supervisor to report positive or negative work behavior.

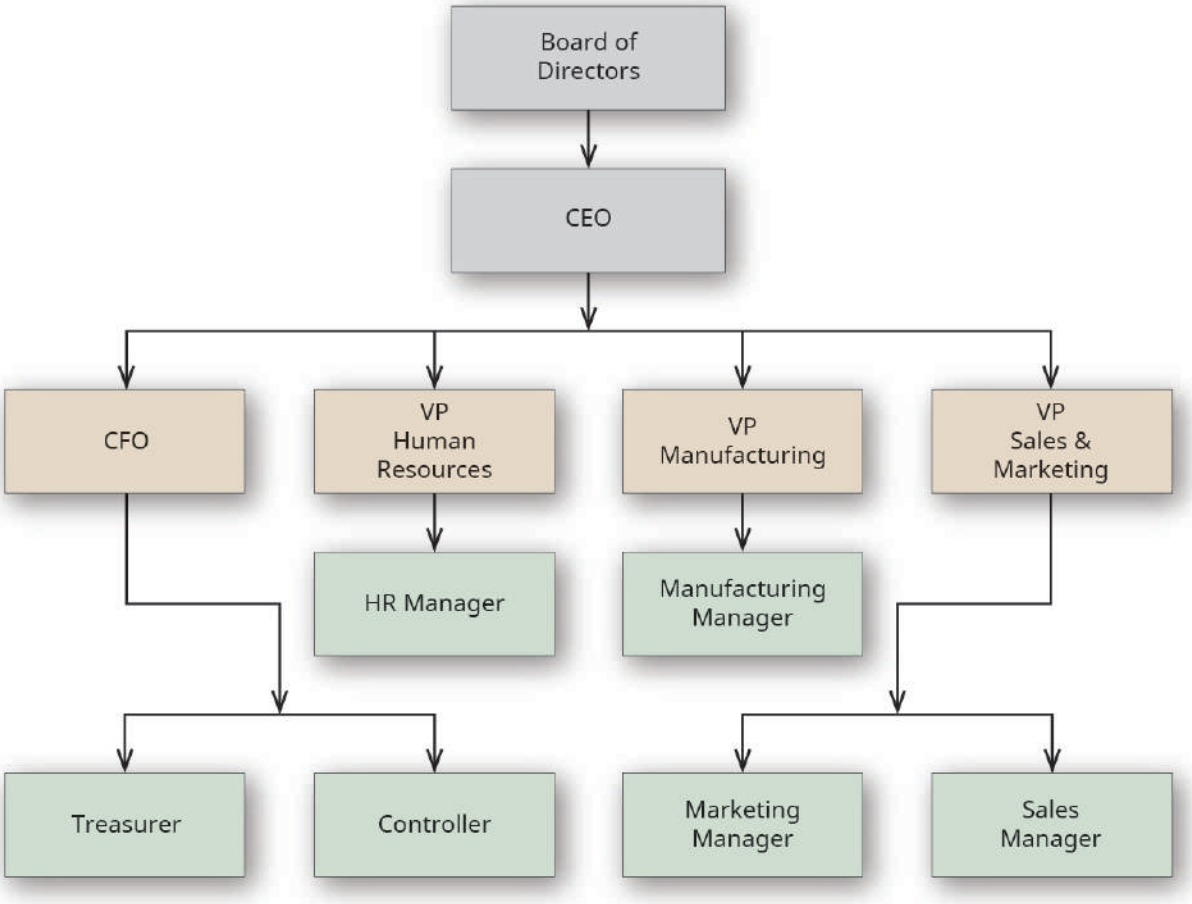


Figure 1.7 Sample Organizational Chart. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Stockholders of a company are the owners; however, they elect a **board of directors** to manage that company for them. The board selects the officers who will implement the policies and strategic goals that the board has set in place. The **chief executive officer (CEO)** is the corporation officer who has the overall responsibility for the management of the company. The person overseeing all of the accounting and finance concerns is the **chief financial officer (CFO)**. This individual is in charge of the financial planning and record-keeping of the organization and reports to the CEO. The **controller** is responsible for the accounting side of the business (accounting records, financial statements, tax returns, and internal reports) and reports to the CFO. Also reporting to the CFO is the **treasurer**, who is in control of the finance side of the business (cash position, corporation funds). An additional area that sometimes falls under the control of the CFO is the internal audit staff. Internal auditors supply independent assurance that a company's internal control processes are effective. However, there is strong support for keeping the internal audit staff outside of the CFO, because of a possible conflict of interest.

THINK IT THROUGH

Managing Cash Flow

Assume you are the managerial accountant at Anchor Head Brewery, a Midwest craft brewery that distributes nationwide. Its year-end is December 31. Because of poor cash flow management, the CFO has some concerns about having enough cash to be able to pay the tax bill that is expected. In early December, the purchasing department bought excess hops, barley, malt, oats, and yeast in anticipation of brewing more beer for the holiday and Super Bowl seasons. In order to decrease the company's net income, thereby reducing their taxable income, the CFO tells you to enter the purchase of this inventory as part of the "Supplies Expense" in the current year.

1. In which account should these materials be recorded?
2. How should you reply to this request?
3. Should you bring this matter to another executive officer?

Careers

The field of managerial accounting, or corporate accounting, is composed of the financial and accounting responsibilities required to operate any type of business. Managerial accountants are employed within organizations to monitor costs, sales, budgets, and spending; conduct audits; predict future requirements; and aid the executive leaders of the organization with financial decision-making.

Figure 1.8 lists approximate salaries for several financial and managerial accounting employment positions. In reviewing the salary information, be aware that there are often major variances in salaries based on geographical locations. For example, a cost accountant manager in San Francisco, California, would typically be paid significantly more than an accountant in a similar position in Fayetteville, Arkansas. However, the cost of living, especially housing costs, in San Francisco is also significantly higher than the cost of living in Fayetteville.

Source: "40 Top Paying Accounting Jobs." *Accounting Degrees Review*. https://www.accounting-degree.org/top-paying-accounting-jobs/

Figure 1.8 Accounting Position Salaries. Salaries are shown for some entry-level and advanced-level jobs available with an accounting degree. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Managerial accountants find employment opportunities in a wide variety of settings and industries. Professionals in this discipline are in high demand from public and private companies, government agencies, and not-for-profit entities (NFPs). Some areas of management accounting are versatile to any sector (corporate, government, or NFP).

- A **financial analyst** assists in preparing budgets, tracking actual costs, examining task performance, scrutinizing different types of variances, and supporting other management personnel in organizing forecasts and projections.
- A **budget analyst** arranges and manages the master budget and compares master budget projections to actual results. This individual must be vastly aware of all operations in the budget and work closely with the rest of the accounting staff as well as management personnel.
- An **internal auditor** typically reports to high-level executives within the company. An internal auditor is often called on to investigate budget variances, industrial sabotage, poor work quality, fraud, and theft. He or she also safeguards the internal controls and confirms they are working and effective.
- A **cash-management accountant** has responsibilities that include transferring monies between accounts, monitoring deposits and payments, reconciling cash balances, creating and tracking cash forecasts, and performing all other cash-related financial processes.

Other areas of managerial accounting are specific to the sector in which accountants work. For example, the area of cost accounting is more specific to the corporate or manufacturing sector. These **cost accountants** amass large sums of data, checking for accuracy and then formulating the cost of raw materials, work in process, finished goods, labor, overhead, and other associated manufacturing costs.

Governmental entities also use accounting to communicate with their constituents. **Government agencies**

include all levels of government, federal, state, county, and city, including military, law enforcement, airports, and school systems. Government accountants deal with budgets, auditing, and payroll, the same as all other managerial accountants. However, they must follow a different set of accounting rules called the Governmental Accounting Standards Board (GASB).

Nonprofit (not-for-profit) organizations are tax-exempt organizations that serve their communities in a variety of areas, such as religion, education, social services, health care, and the arts. Managerial accountants in this area are most often focused on budgets. The biggest difference between a corporate budget analyst and a nonprofit budget analyst is that the nonprofit analyst works the budget backward, compared to the corporate analyst. For example, if a corporation was selling widgets, its budget would start with a sales forecast of how many widgets the company thinks it can sell. This gives the company a forecast of how much it can spend on expenses and fixed assets. The nonprofit budget analysts often start with the expenses. They forecast how much the expenses will be in order to continue to offer their service to the community. From there, they then adjust how much they will need to obtain through fundraising, donations, grants, or other sources to meet their expenses.

YOUR TURN

Career Planning

All companies need to plan ahead in order to continuously move forward. Their top management must take into consideration where they want the company to be in the next three to five years. Just like a company, you also need to consider where you want to be in three to five years, and you need to start taking strides now to accomplish what it is you need to in order to get there (Figure 1.9).

Figure 1.9 Career Planning. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Answer the following:

1. What job would you like to be doing in three to five years? What is your plan for getting there? Identify five to ten steps needed.
2. Do you have a specific company you would like to be working for in the next three to five years?

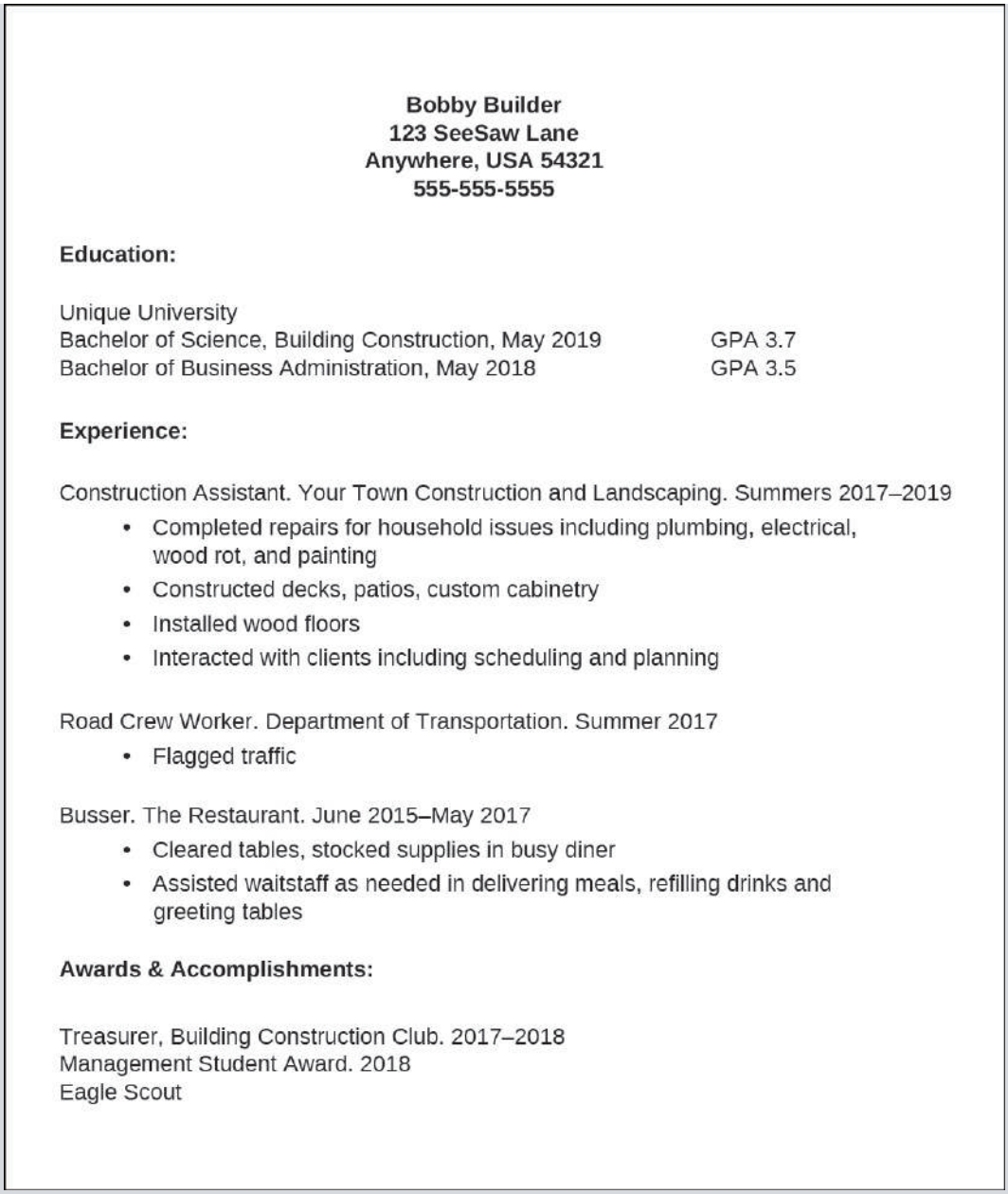
What are the reasons you want to work for them?

3. In order to acquire the position you want, at the company you want, you need a résumé. Your résumé is like the company report of "you." It needs to offer reliable information about your experiences and achievements. What are the basic elements of a résumé, and how will you provide reassurance that the information on your résumé is trustworthy?

Solution

Answers will vary. Sample answer:

1. I would like to own my own home remodeling company. Steps to get there include the following:
   A. complete double major in business and building construction
   B. in the summers before graduation, work for a local handyman franchise
   C. after graduation, work for a home builder as a project manager
   D. while working, save money for five years to be used to start my own company
   E. put together a business plan
   F. start my own business six years after graduation
2. I would like to work for a national home builder such as Pulte or Toll Brothers. Ideally, I would have an internship with one of them during college. I would like to work for a national builder or a large regional builder because they already have a good business model and I could learn how that works.
3. My résumé needs to contain my education information such as the degree and my majors as well as classes that are pertinent to my career. It should also indicate all of my work experience and any particular skills or certifications I have achieved, such as Eagle Scout. An example of how this information may be presented on a résumé can be seen in Figure 1.10.



Bobby Builder
123 SeeSaw Lane
Anywhere, USA 54321
555-555-5555

Education:

Unique University
Bachelor of Science, Building Construction, May 2019 GPA 3.7
Bachelor of Business Administration, May 2018 GPA 3.5

Experience:

Construction Assistant. Your Town Construction and Landscaping. Summers 2017–2019

- Completed repairs for household issues including plumbing, electrical, wood rot, and painting
- Constructed decks, patios, custom cabinetry
- Installed wood floors
- Interacted with clients including scheduling and planning

Road Crew Worker. Department of Transportation. Summer 2017

- Flagged traffic

Busser. The Restaurant. June 2015–May 2017

- Cleared tables, stocked supplies in busy diner
- Assisted waitstaff as needed in delivering meals, refilling drinks and greeting tables

Awards & Accomplishments:

Treasurer, Building Construction Club. 2017–2018
Management Student Award. 2018
Eagle Scout

Figure 1.10 Sample Résumé. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Certifications

There are many distinct accounting certifications that accountants can earn in order to improve their careers, attain promotions, and acquire raises in their pay. The certifications are somewhat different from each other and focused toward different career paths. Many accountants have more than one of these credentials to diversify their paths.

The **Certified Public Accountant (CPA)** is considered the top tier in accounting certifications. Many

companies or positions require CPA certification. For example, most employees at accounting firms earn a CPA certificate within the first few of years of graduation. Some positions, such as controller or CFO, often require CPA certification. In the United States, each state has different educational and experience requirements in order to obtain the CPA. The certification requires passing the four-part CPA exam as well. This is administered by the American Institute of Certified Public Accountants (AICPA). There are four parts to the exam: Financial Accounting and Reporting (FAR), Auditing and Attestation (AUD), Regulation (REG), and Business Environment and Concepts (BEC). Each part is graded on a 100-point scale. A score of seventy-five or greater must be achieved in order to pass each section. The exams can be intimidating, as it is a difficult process to go through. As of 2017, the AICPA reported a pass rate of less than 50 percent, which may contribute to its high regard around the world. After passing the CPA exam, candidates must work for one year under the supervision of a licensed CPA before their own license is approved by a state regulatory agency. Those certified in public accounting work in all areas of accounting. However, do not assume that being a CPA is the only way to secure an excellent position in accounting.

The **Certified Management Accountant (CMA)** is another top-tiered certification for accountants. The CMA title identifies the individual as a specialist in corporate accounting management. The CMA has some overlap with the CPA, but the CPA is focused more on compliance, tax, and controls. CMAs favor financial analytics, budgeting, and strategic assessment. This certification requires the minimum of a bachelor's degree from an accredited college or university, two years of work experience, and successfully passing both parts of the exam. Part one of the exam covers financial reporting, planning, performance, and controls. Part two focuses on financial decision-making. The exam is administered by the IMA and has a 50 percent passing rate globally.

Not as popular in the United States as the CPA, the **Certified Financial Analyst (CFA)** certification is more in demand throughout Europe and Asia. This certification prepares accountants for a career in the finance and investment domains. Requirements of this credential include a bachelor's degree or four years' worth of experience, plus passing all three sections of the exam. The exam is administered by the CFA Institute. There are three separate exams, each one taking up to six hours to complete. The exams must be completed in succession. This credential is considered one of the more rigorous ones to obtain, with a passing rate of less than 45 percent.

The **Enrolled Agent (EA)** credential focuses on a career in taxation, whether it is working in tax preparation for the public, internally for a corporation, or for the government at the Internal Revenue Service (IRS). The EA certification was created by the IRS to signify significant knowledge of the US tax code and the ability to apply the concepts of that code. Enrolled agents have the privilege of being able to sign tax returns as paid preparers, and they are able to represent their clients in front of the IRS. The EA certification can be obtained by passing a three-part exam covering all types of individual and business tax returns. Once the certification is obtained, enrolled agents must follow strict ethical standards and complete 72 hours of continuing education courses every three years.

The **Certified Internal Auditor (CIA)** is a credential offered by the Institute of Internal Auditors (IIA) and is one of the only certifications that is accepted worldwide. CIAs tend to be employed in auditing areas within government agencies, banking, finance, or corporations. They examine financial documents to investigate deficiencies in internal controls. Requirements for this certification include a bachelor's degree, two years of work experience in a related field, and passing the three sections of the examination. Also required are providing character references, following a code of ethics, and continuing education.

The **Certified Fraud Examiner (CFE)** certification signifies proven proficiency in fraud prevention, detection, and deterrence. CFEs are instructed in how to identify the red flags that may indicate fraudulent actions. The designation is awarded by the Association of Certified Fraud Examiners (ACFE) after applicants have met the

following requirements: bachelor's degree, two years of work-related experience, moral character references, and the passing of four separate exams.

The **Certified Government Auditing Professional (CGAP)** designation is exclusively for auditors employed throughout the public sector (federal, state, local) and is offered by the IIA. Requirements for this credential are the same as for the CIA. The exam has 115 multiple-choice questions and covers four areas focusing on proficiency in generally accepted government auditing standards (GAGAS).

These certifications lead to different job responsibilities and different career paths. As indicated, each of the certifications requires varying degrees of education and has exams that are unique to that particular certification. All of these certifications also require a certain number of hours of continuing education in order to keep the certification active. This ensures that the certificate holder is up to date on changes in the field. There are always many opportunities throughout the year to obtain continuing education credits through seminars, webinars, symposiums, and online and in-person classes.

LINK TO LEARNING

Accounting.com has an application that will help to acquaint you with the different opportunities available, skill sets that may be required, and different salaries for accounting careers. See the Careers in Accounting report (https://openstax.org/l/50AccountCareer) for more information.

1.4 Describe the Role of the Institute of Management Accountants and the Use of Ethical Standards

As you've learned, unlike the specific rules set forth by GAAP and the SEC that govern financial accounting, managerial accounting does not have specific rules and is considered flexible, as the reporting stays internal and does not need to follow external rules. Managers of a business need detailed information in a timely manner. This means that a managerial accountant needs to understand many detailed aspects of how the company operates in addition to financial accounting methods, because the framework of typical management reports often comes from the financial statements. However, the reports can be individualized and customized to the information the manager is seeking. Each company has different strategies, timing, and needs for information.

The **Institute of Management Accountants (IMA)**, the professional organization for management accountants, provides research, education, a means of knowledge sharing, and practice development to its members. The IMA also issues the Certified Management Accountant (CMA) certification to those accountants who meet the educational requirements, pass the rigorous two-part exam, and maintain continuing professional education requirements. The CMA exam covers essential managerial accounting topics as well as topics on economics and finance. Many accountants hold both CMA and CPA certifications.

Business Ethics

The IMA also develops standards and principles to help management accountants deal with ethical challenges.

Trust is an important cornerstone of business interactions, both internal and external. When there is a lack of trust, it changes how decisions are made. Trust develops when there are good ethics: when people know right from wrong. Consider these three questions as put forth by the Institute of Business Ethics: (1) Do I mind others knowing what I have done? (2) Who does my decision affect or hurt? (3) Would my decision be considered fair to those affected? These questions can help evaluate the ethics of a decision.

Ethics is more than simply obeying laws; it involves doing the right thing as well as the legal thing. Many companies have a code of conduct to help guide their employees. For example, Google has a code of ethics that they expect all of their employees and board members to follow. Failing to do so can cause termination of employment. The preface of the code includes "Don't be evil." They use that to show all employees and other shareholders within Google that they are serious about ethics—that trust and respect are essential in providing a great service to their customers.

The IMA has its own Statement of Ethical Professional Practice for its members. Managerial accountants should never commit acts that violate the standards of ethics, and they should never ignore such deeds by others within their companies. Many other professional organizations, across many different professions, have codes of ethics. For example, there are codes of ethics for the AICPA, ACFE, Financial Executives International, American Marketing Association, National Society of Professional Engineers, and the American Nurses Association.

ETHICAL CONSIDERATIONS

Institute of Management Accountants (IMA) Ethical Standards

Four standards of ethical conduct in management accountants' professional activities were developed by the Institute of Management Accountants. The four standards are competence, confidentiality, integrity, and credibility. Credibility is a key standard that is based on an accountant communicating information with fairness and objectivity, disclosing all information that is relevant to the intended users understanding, and disclosing "delays or deficiencies in information, timeliness, processing, or internal controls in conformance with organization policy and/or applicable law."[6]

Often, when we think of unethical behavior, we imagine large-scale scenarios involving tens of thousands of dollars or more, but ethical issues are more likely faced on a small scale. For example, suppose you work for an organization that makes and sells virtual reality headsets. Because of competition, your company has decreased their forecasted sales for next year by 20 percent over the current year. In a meeting, the CEO expressed concern over the effect of the decreased sales on the bonuses of upper-level executives, since their bonus is tied to meeting income projections. The vice president of marketing suggested in the meeting that if the company simply continued to produce the same number of headsets as they had in the previous year, income levels may still be achieved in order for the bonuses to be awarded. This would involve the company producing excess inventory with hopes of selling them, in order to achieve income levels sufficiently adequate to be able to pay bonuses to executives. While a conflict of interest might not be intuitively obvious, the company (and thus its managerial accountants) has an obligation to many stakeholders such as investors, creditors, employees and the community. The obligation of a corporation to these stakeholders depends

6 Institute of Management Accountants. "Standards of Ethical Conduct for Management Accountants." AccountingVerse. https://www.accountingverse.com/managerial-accounting/introduction/code-of-ethics.html

somewhat on the stakeholder. For example, the primary obligation to a creditor may be to make timely payments, the obligation to the community may be to minimize negative environmental impact. Most stakeholders to not have access to internal information or decisions and thus rely on management to be ethical in their decision-making. The company may indeed be able to sell all that it produces, but given the forecasted drop in sales, producing the same number of units as during the current year will likely lead to unsellable inventory, the need to sell the units at a significant discount in order to dispose of them, or both. Following the recommendation to produce more than forecasted sales might hurt the value of the company's stock, which could hurt many categories of stakeholders who depend on the accountants and financial analysts to protect their financial interests.

In addition to managing production and inventory, a budget and the entire budget process have an impact on managerial decision-making. Suppose you are the manager of the research department of a pharmaceutical company. Your budget includes the costs for various types of training for your staff. Because of the amount of time spent in development of a highly promising medication to treat diabetes, your staff has not had time to complete as much training during the current year as you had allowed for in the budget. You are concerned that if you do not use the training money, your training budget will be decreased in the next budget cycle. To prevent this from happening, you arrange for several online training sessions for your staff. These training sessions are on the basics of laboratory safety. All of your staff is very experienced and current on this topic and can likely go straight to the course completion quiz and complete it in a matter of minutes without actually watching any of the ten modules. What would encourage a manager to schedule and spend money on training that is not useful for the employees? While it is expected to stay within the budget, many managers will spend any "excess" amounts remaining in the budget at the end of the fiscal year. This practice is known as "use it or lose it." Managers do this to avoid having their budgets cut in the next fiscal year. Stated simply, management spends everything in their budget regardless of the value added or the necessity. This is not ethical behavior and is usually the result of a budgetary process that needs to be modified so that the possibility of being able to pad the budget is removed or at least minimized.

All employees within a company are expected to act ethically within their business actions. This can sometimes be difficult when the company itself almost promotes the idea of unethical actions. For example, Wells Fargo started offering incentives to their employees who succeeded in selling to current customers other services and products that the bank had to offer. This incentive created an unethical culture. Employees manufactured fake accounts, credit cards, and other services in order to qualify for the bonuses. In the end, 5,300 employees lost their jobs, and everyone learned a lesson on creating proper incentives. Executives who aspire to run an ethical company can do so, if they change reward systems from "pay for performance" to more holistic values. Examples of proper incentives include attendance rewards, merit rewards, team bonuses, overall profit sharing, and stock options.

LINK TO LEARNING

Most, if not all, major corporations have a code of ethics or a code of conduct. Read Google's Code of Conduct (https://openstax.org/l/50GoogleCode) and consider the following questions:

- What is the basic foundation for their code of conduct? What do you think it means?
- After reading their document, has it changed your opinion of the company?

- Do you think having a code of ethics or a code of conduct really matters?

Ethics Legislation

In response to several corporate scandals, the United States Congress passed the **Sarbanes-Oxley Act of 2002 (SOX)**, also known as the "public company accounting reform." It is a federal law (http://www.soxlaw.com/) that was a far-reaching reform of business practices. Its focus is primarily on public accounting firms that act as auditors of publicly traded corporations. The act intended to protect investors by enhancing the accuracy and reliability of corporate financial statements and disclosures. Thousands of corporations now must confirm that their accounting processes comply with SOX. The act itself is fairly detailed, but the most significant issues for compliance are as follows:

- Section 302. The CEO and CFO must review all financial reports and sign the report.
- Section 404. All financial reports must be audited on an annual basis and must be accompanied by an internal control audit.
- Section 806. **Whistleblowers**, or those who provide evidence of fraud, are afforded special protections.
- Section 906. The criminal penalties for a fraudulent financial report are increased from pre-SOX. Penalties can be up to $5 million in fines and up to 25 years in prison.

LINK TO LEARNING

The Sarbanes-Oxley Act has been in place for many years now and has its champions and its critics. Read this 2017 article from Accounting Today on the benefits and negative impacts of the act (https://openstax.org/l/50SOAcctToday) to learn more. This article from ConnectUS discusses the benefits and negative impacts (https://openstax.org/l/50SOConnectUS) as well.

Individuals who work throughout the accounting profession have a significant responsibility to the general public. Financial accountants deliver information about companies that the public uses to make major financial decisions. There must be a level of trust and confidence in the ethical behavior of these accountants. Just like others in the business world, accountants are confronted endlessly with ethical dilemmas. A high standard of ethical behavior is expected of those employed in a profession. While ethical codes are helpful guidelines, the rationale to act ethically must originate from within oneself, from personal morals and values. There are steps that can provide an outline for examining ethical issues:

1. Recognize the ethical issue at hand and those involved (employees, creditors, vendors, and community).
2. Establish the facts of the situation (who, what, where, when, and how).
3. Recognize the competing values related to the issue (confidentiality and conflict of interest).
4. Determine alternative courses of action (do not limit yourself).
5. Evaluate each course of action and how each relates to the values in step 3.
6. Recognize the possible consequences of each course of action and how each affects those involved in step 1.
7. Make a decision, and take a course of action.

8. Evaluate the decision. (Is the issue solved? Did it create other issues?)

ETHICAL CONSIDERATIONS

Ethical Dilemma

You are about to sign a new client to a very large contract worth over $900,000. Your supervisor is under a lot of pressure to increase sales. He calls you into his office and tells you his future with the company is in jeopardy, and he asks you to include the revenue for the new contract in the sales figures for the quarter that ends today. You know the contract is a certainty, but the client is out of town and cannot possibly sign for at least a week. Use the eight steps in examining an ethical situation to determine how you would react to this situation.

One of the issues with ethics is that what one person, community, or even country considers unethical or wrong may not be problematic for another person, community, or country, who see it as a way of doing business. For example, **bribery** in the world of business happens when an organization or representative of an organization gives money or other financial benefits to another individual, business, or official in order to gain favor or to manipulate a business decision. Bribery in the United States is illegal. However, in Russia or China, a bribe is sometimes one cost of doing business, so it is part of their culture and completely ordinary.

The **Foreign Corrupt Practices Act (FCPA)** was implemented in 1977 in the aftermath of disclosures of bribery of foreign bureaucrats by more than 400 US corporations. The law is broken down into two parts: the antibribery section and the accounting section. The antibribery section specifically prohibits payments to foreign government officials to aid in attaining or retaining business. This provision applies to all US persons and foreign firms acting within the United States. It also requires corporations that are listed in the United States to converge their accounting records with certain accounting provisions. These include making and keeping records that fairly represent the transactions of the company and maintaining an acceptable system of internal controls. Companies doing business outside the United States are obligated to follow this law and dedicate resources to its compliance.

The accounting section of the FCPA requires a company to have good internal controls so a slush fund to pay bribes cannot be created and maintained. A *slush fund* is a cash account that is often created for illegal activities or payments that are not typically recorded on the books.

More details on the SOX and the FCPA are covered in such courses as auditing, intermediate accounting, cost accounting, and business law.

YOUR TURN

Logistics Analyst

As a corporate accountant, it is very important to understand both financial and managerial aspects of the company and industry in which you are working. In order to assist management in their roles of planning, controlling, and evaluating, an accountant needs to be aware not only of GAAP but also of the

products or services offered by the company, the processes by which those products or services are produced, and pertinent facts about suppliers, customers, and competitors. Not having this knowledge not only makes it more difficult for the corporate or managerial accountant to perform any assigned duties, but there is also an ethical responsibility to be knowledgeable in order to offer assistance, analysis, or recommendations to management or customers.

Assume you have been hired by Triumph Motorcycles as a new logistics analyst. In this position, you will carry out such tasks as obtaining and analyzing information about your company's goods or services; monitoring the production, service, and information processes and flow; and looking for ways to improve efficiency of operations.

How would you go about obtaining the knowledge and understanding you will need to work for this company? How would financial and managerial accounting concepts help you in understanding the company and the industry as a whole?

Solution

Answers will vary. Sample answer:

Ways to learn about the company and industry include the company website, press or news releases, industry trade journals, company internal documents such as procedure manuals and job descriptions, and conversations or interviews with fellow employees at various levels of the organization. The more knowledge you have regarding financial and managerial accounting, the better you can link the operations of the organizations to financial results and the more easily you can ascertain both efficiencies and inefficiencies in the organization.

1.5 Describe Trends in Today's Business Environment and Analyze Their Impact on Accounting

The business environment never rests. Regulations are always changing, global competition continues to increase, and technology provides continual disruption. Management accounting is always evolving due to changes in the business environment. The types of information needed and obtainable have changed significantly over time.

Many areas of employment are impacting businesses and the managerial accounting function today. For example, more than 60 percent of workers in the United States are employed within service industries, such as government agencies, marketing firms, accounting firms, and airlines. The health-care and social service industries have doubled in size. However, as the number of service jobs has increased, the number of manufacturing jobs, as a percentage of all jobs, has been decreasing.[7] One of the primary reasons for the decline in manufacturing jobs is automation and other technological changes.

How are service industries different from manufacturing organizations? The fundamental difference is the product they sell. The service company, such as a marketing, legal, or consulting firm, produces **intangible goods**, meaning that the product has no physical substance. Manufacturing companies produce **tangible goods**, which customers can handle and see. This leads to another significant difference between manufacturing companies and service firms: inventory. Service firms, unlike manufacturing, do not have large

7 Dr. Patricia Buckley. "Geographic Trends in Manufacturing Job Creation: Something Old, Something New." *Deloitte Insight*. September 25, 2017. https://www2.deloitte.com/insights/us/en/economy/behind-the-numbers/geographic-trends-in-manufacturing-job-creation.html

inventories, because there is no tangible product. Manufacturing will have inventories of raw materials, of goods that are in the process of being produced and goods that have been completed but not yet sold. Managerial accountants must track all of this information for manufacturing companies. However, managerial accountants are still needed within service-based firms to track time, materials, and overhead. For example, Boeing Company is a manufacturer of airplanes. Their accountants must track several different types of inventory categories, direct labor, and overhead costs, among other things. One of Boeing's customers, Delta Air Lines, is a service-based company. The managerial accountants for the airline also are responsible for following costs, but their reports are targeted toward industry-specific measures such as operating margins, revenue from passenger miles, load factors, and passenger yield, among others.

Much of managerial accounting focuses on manufacturing. However, the techniques used for cost accounting for manufacturing companies also can be applied to service-based organizations. The former would develop a cost of goods manufactured schedule, and the latter would need a cost of service schedule. The structure of the reports is principally the same, but section headings would reflect the type of organization.

Technology

Business entities always look for ways to leverage technology. Any type of technology that can increase production, reduce costs, or increase safety will attract attention from the business world. There are many areas of technology that businesses have used already, but to continue reaping those benefits, these companies need to adjust quickly with the ever-advancing business technology.

Companies have the ability to integrate many of their business processes through **enterprise resource planning (ERP)** systems, which help companies streamline their operations and help management respond quickly to change. Although they are expensive, these systems help alleviate the complications that arise from business systems that do not coordinate with one another. For example, a company may have many different individual systems for each function: human resources may have a system to track employees' insurance benefits, training, and retirement programs, while payroll may have a program that tracks employees' earnings, taxes, deductions, and direct deposit information. Much of the information human resources and payroll collect is the same. Having one system with different silos is much more efficient than having two separate systems. Management must be aware of and adapt to whichever type of system that the business has—either one ERP or several independent systems that may not coordinate information (Figure 1.11).

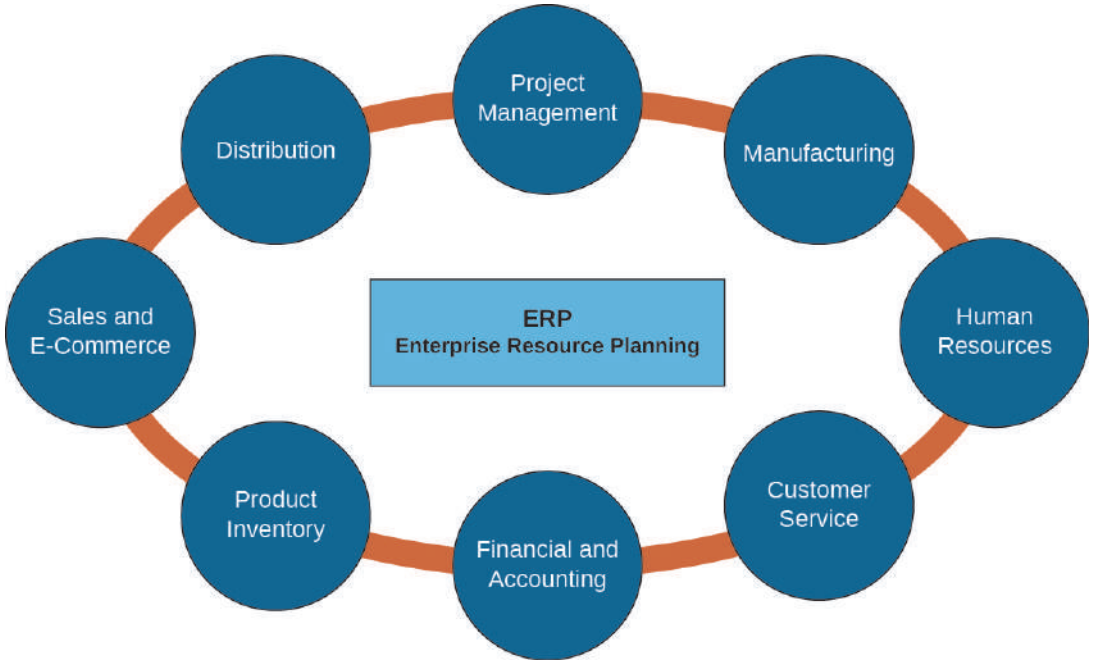


Figure 1.11 Eight Primary Components of Enterprise Resource Planning (ERP). The diagram shows the role of ERP in streamlining a business by coordinating the various components of that business. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Businesses have been on the forefront of advancing technology. As computer systems developed throughout the twentieth century, they brought with them the potential for many benefits, but the business world needed to adapt and transform their infrastructure. Over the last forty years, tangible assets (buildings, machinery, and vehicles) have declined from 80 percent of a company's value to 15 percent, while intangible assets (trademarks, patents, and competencies) are now at an average of 85 percent of a company's value. It can be difficult to put a value on some of the intangible assets, but it is not hard to realize they do have worth. JetBlue has the number one brand loyalty of all North American airlines. Apple has built a kingdom around brand loyalty. Intangible assets can give a company a competitive edge, entice consumers, and protect the organization's brain trust.

Technological advances can directly affect managerial accounting reports, through estimates of overhead costs. Historically, overhead was typically calculated on the basis of relatively straightforward relationships, such as direct labor costs or direct labor hours. With the advancements through automation, in many instances, direct labor costs are much lower and no longer relevant in computing overhead costs. **Automation** is a method of using systems such as computers or robots to operate different processes and machinery to improve efficiencies and lower direct labor costs. Companies use automation to remove the complex, superfluous stages from a process in order to streamline the practice. In essence, labor is being traded for machine production. Such industries as auto production are excellent examples. This exchange of direct labor for greater costs in overhead for such factors as machinery depreciation will be addressed in Job Order Costing and Process Costing on calculating production costs.

LINK TO LEARNING

Automation has changed the production of automobiles over the last 100 years. This 100-second video from Ford Motor Company on automation (https://openstax.org/l/50Ford) demonstrates this concept.

With the growth of the Internet and the speed by which information is shared, businesses can now communicate with employees from around the world within seconds. This has made outsourcing common in certain sectors. **Outsourcing** is hiring workers outside of the company who perform their tasks inside or outside of the country. Most of the exported jobs have gone to less-developed countries, where there are lower labor costs. Outsourcing saves the company money on labor and overhead costs and has become a major trend over the past several years. More and more organizations, both large and small, are now using outsourcing as a way of growing their entities without adding additional labor and overhead costs. Outsourcing allows a company to focus on its own competencies and hire those outside sources to handle other duties.

Another technology that is quickly becoming widespread is **radio-frequency identification (RFID)**. This technology uses electromagnetic fields to routinely identify and trace inventory tags that have been attached to objects. The tags contain information that has been stored by electronic means. The RFID tags can made into many shapes and sizes and enclosed in many different materials. These tiny devices have advantages over the common bar code. They do not need to be positioned precisely over the scanner and cannot be manipulated like barcodes. This technology has been used for many years in identifying and tracking lost pets, but it was considered too expensive for more extensive use in industry. With the advancements over the last several years, RFID devices are now seen as “throwaway” control devices. One company recently signed a contract to sell 500 million RFID tags at a cost of about ten cents per device. Other current uses include antitheft tags attached to merchandise, credit card chips, and heavy-duty transponders used in shipping containers. New uses being investigated include RFID chips in passports, food, and people.

THINK IT THROUGH

Outsourcing

With the increase in global businesses and competition, there has been an increased focus on outsourcing in order to reduce costs. As you’ve learned, outsourcing involves hiring an outside company to provide services or products rather than having them produced internally.

For example, you are the vice president of operations for a manufacturing firm. Other firms similar to yours have outsourced some of the product assembly. You estimate that you could save a significant amount of money on wages and benefits, as you would let go approximately ten workers if you outsource. Would you outsource? Why or why not?

Lean Practices

All companies want to be successful. This requires continuously trying to improve the function of the organization. A **lean business model** is one in which a company strives to eliminate waste in its products, services, and processes, while still fulfilling the company's mission. This type of model was originally implemented by the Japanese automaker, Toyota Motor Corporation, soon after the end of World War II. The implications of an organization adopting a lean business model can be overall business improvement, but a lean business model can be difficult to implement because it often requires all systems and procedures that an organization follows to be readjusted and coordinated. Managerial accounting plays a vital role in the success and implementation of a lean business model by providing accurate cost and performance evaluation information. Entities must comprehend the nature and sources of costs and develop systems that encapsulate costs accurately. The better an organization is at controlling costs, the more it can improve its overall financial performance. **Continuous improvement** is the manufacturing process that rejects the ideas of "good enough." It is an ongoing effort to improve processes, products, services, and practices. This philosophy has led organizations to adopt practices such as total quality management, just-in-time manufacturing, and Lean Six Sigma. The fundamental ideas of all of these involve continuous improvement; they differ only in focus.

Total quality management (TQM) concentrates on quality improvement and applies this benchmark to all aspects of business activities. In TQM, management and employees look to reveal waste and errors, streamline the supply chain, improve customer relations, and confirm that employees are informed and properly trained. The objective of TQM is continuous improvement by concentrating on systematic problem-solving and customer service. Scientific methods are used to study what succeeds and what does not, and then the best practices are implemented throughout the organization.

However, the pursuit of total quality will cost the company money. With the help of management accountants, companies can track these costs and forecast whether or not the improvements will eventually save the organization money down the road.

Just-in-time (JIT) manufacturing is an inventory system that companies use to increase efficiency and decrease waste by receiving goods only as they are needed within the production process, thereby reducing warehousing costs. This method requires accurate forecasting. Managerial accountants work together with purchasing and production schedulers in keeping the flow of materials accurate and efficient.

This method was initiated by Toyota Motor Corporation, and it has expanded to many other manufacturing organizations throughout the world. Toyota set the example by controlling their inventory levels by relying on their supply chain to deliver the raw materials it needed to build their cars. The parts arrived just as they were needed, not before or after.

One major advantage of JIT manufacturing is reducing costs by eradicating warehouse storage needs. Organizations, in turn, tend to spend less money on raw materials because of a reduction in spoilage and waste. Another advantage is that companies can easily move from the assembly of one product to the assembly of another.

Disadvantages of JIT manufacturing start with its complexity. In moving from a traditional manufacturing approach to a JIT approach, management must reconfigure the entire flow of the production process, from the initial use of the raw materials to the output of the final finished good. Another disadvantage of JIT manufacturing is that it makes organizations more susceptible to disruptions in the supply chain. If a supplier of raw materials has a labor strike, weather problems, a breakdown of machinery, or some other catastrophe and cannot deliver the materials on time, that one supplier can shut down an entire production process and delay delivery of finished goods. An example of this occurred in 2011 after a tsunami and earthquake hit Japan

and disrupted production at a critical supplier of auto parts. General Motors (GM) facilities in the United States announced they would have to shut down assembly plants where they could not continue production without the parts from Japan.

Lean Six Sigma (LSS) is a quality control program that depends on a combined effort of many team members to enhance performance by analytically removing waste and diminishing variations between products. The *lean* component of LSS is the concept that anything that is not needed in a product or service, or any unnecessary steps that exist, add cost to the product or service and therefore should be considered waste and eliminated. The *Six Sigma* component of LSS has to do with the elimination of defects. Essentially, as a company becomes leaner, it should also be able to reduce defects in manufacturing or in providing a service. Fewer defects add to cost savings through the need for fewer reworked products, fewer repeat service calls, and therefore, more satisfied customers. It was developed by Motorola in 1986 and emphasized cycle-time improvement and the reduction of defects. This process has shown to be a powerful way of improving business efficiency and effectiveness. As organizations continue to modify and update their processes for optimal productivity, they must be flexible. As of 2017, LSS had developed into a business management way of thinking that focused on customer needs, customer retention, and improvement of business products and services. There are many establishments, including Motorola, that now do LSS training. There are certifications including white belt, yellow belt, green belt, black belt, and master black belt. The belts signify an employee's knowledge regarding LSS. For example, a white belt understands the terminology, structure, and idea of LSS and reports issues to green or black belts. A green belt typically manages LSS projects, and a master black belt works with upper-level management to find the areas in the business where LSS needs to be implemented, leads several LSS teams, and oversees implementation of those projects.

Kaizen (Japanese for *change for the better*) is another process that is often linked to Six Sigma (Figure 1.12). The two concepts are often used together for process improvements, as they both are designed for continuous improvement by eliminating waste and increasing efficiencies. The concept of *kaizen* comes from an ancient Japanese philosophy that involves continuously working toward perfection in all areas of one's life. It was adopted in the business world after World War II in an effort to rebuild Japan. It centers on making small, day-to-day changes that develop into major improvements over time. The key behind the success of kaizen comes from requiring all employees—from the CEO at the top, all the way down to the shop-floor janitors—to participate by making recommendations to improve the organization. From the start of the process, it must be well defined that all recommendations are appreciated and that there will be no adverse results for participating. Workers, instead, should be rewarded for any modifications that advance the workplace. Employees become more self-assured and invested when they help improve the company.

Figure 1.12 Kaizen Board Showing Kaizen Process and Some Related Tactics. (credit left: modification of "Woman Standing in Front of Sitting People" by "rawpixel.com"/Pexels, Pexels license / Public Domain; right: modification of "A few kaizen tactics" by Sacha Chua/Flickr, CC BY 2.0)

Another lean practice, the **theory of constraints (TOC)**, involves recognizing and removing bottlenecks within the value chain that may be limiting an organization's profitability. This philosophy, developed by Dr. Eliyahu M. Goldratt, is a valuable instrument for improving the flaws in processes. The main goal of this methodology is to remove obstructions, or constraints, which are referred to as "bottlenecks." There are several types of bottlenecks that organizations must deal with endlessly. One example occurs at the grocery store when it is crowded and there are only three checkout lanes open but ten people in each line. Obviously, the bottleneck is created by having too few checkout lanes open. The bottleneck can be mitigated by opening more checkout lanes. Other examples are listed in Table 1.5.

Examples of Constraints

Bottleneck	Examples
Physical	Employee resources, limited space, equipment resources
Policy	Procedures, regulations, contracts
Culture	"It's the way we've always done it"
Market	Size of the market, demand for product, nature of competition

Table 1.5

There are five steps in the cycle of continuous improvement under TOC:

1. Identify the system constraint.
2. Decide how best to exploit the constraint and make quick changes using existing resources.
3. Subordinate everything else to the process to ensure alignment with and support of the needs of the constraint.
4. Elevate the system's constraint, and determine if the constraint has shifted to another area in the process.
5. Repeat the process.

This is a continuous cycle; therefore, once a bottleneck is solved, the next bottleneck should be addressed immediately (Figure 1.13).

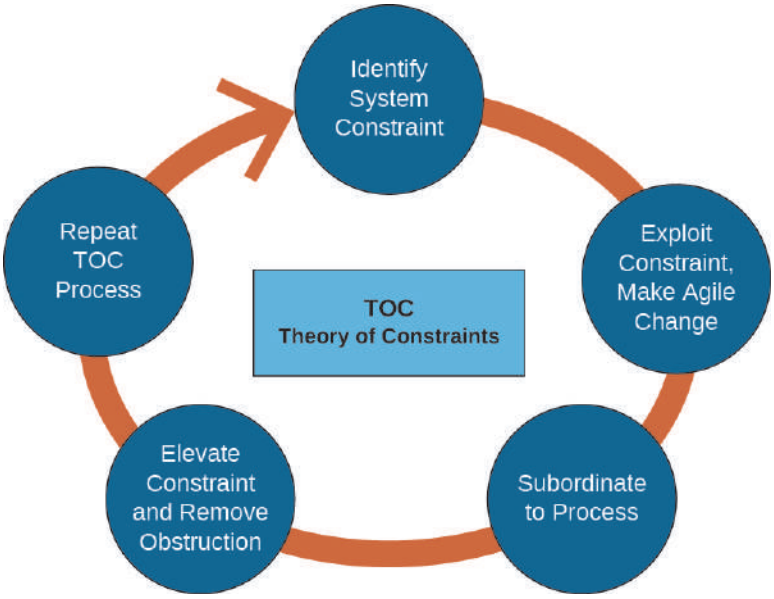


Figure 1.13 Five Focusing Steps of the Theory of Constraints in Its Cyclical Process. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Balanced Scorecard

The **balanced scorecard (BSC)** approach uses both financial and nonfinancial measures in evaluating all attributes of the organization's procedures. This approach differs from the traditional approach of only using financial measures to evaluate a company. While financial measures are essential, they are only a portion of what needs to be evaluated. The balanced scorecard focuses on both high-level and low-level measures, using the company's own strategic plan. This method assesses the organization in four separate perspectives:

- Financial. The financial measures are the major focus of the BSC—but not the only measures. This perspective asks questions like whether the organization is making money or whether the stockholders are pleased.
- Customer. The BSC also evaluates how the organization is perceived, from the customer's perspective. This measures customer satisfaction, new customer growth, and market share.
- Internal process. The internal procedures and processes perspective observes how smoothly things are running. This perspective will examine quality, efficiency, and waste as they relate directly to the products or services.
- Learning and growth/capacity. This area evaluates the entity and its performance from the standpoint of human capital, infrastructure, culture, technology, and other areas. Are employees collaborating and sharing information? Does everyone have access to the latest trends in training and continuing education in their areas?

The main advantage of this approach is that it offers organizations a way to see the cause-and-effect in the objectives. For example, if an organization would like to make more money in order to pay higher dividends to its stockholders, the organization will need to increase market share, improve customer satisfaction, or grow its customer base. In order to make customers happier or gain new customers, the organization could try to reduce defects and increase overall quality of the products; to accomplish that, the organization could retrain or offer new training to its employees.

Globalization

The development of business through international influence or extending social and cultural aspects around the world is known as **globalization**. It has expanded our competitive borders, giving customers more alternatives. Customers can order an item from another country with the click of a button and have that item delivered in a few days or less. How has globalization affected companies? Not only must they choose between ordering goods or components globally, but they must decide in which countries to sell their goods, and in which companies they may be able to establish factories.

Globalization affects management accountants in several ways. Companies need real-time, accurate information to make good decisions, so more timely and accurate information is needed. As companies expand globally, managers need to know the cost of operating internationally, as well as the laws, rules, and customs. Globalization also can expose companies to improvements in running a business.

Debates continue as to the positive and negative consequences of globalization in all of its contexts. The advantages of globalization include helping developing countries in creating jobs, developing industries, differentiating and expanding their markets, and bettering their standard of living for their citizens. Some believe the expansion of pop culture around the globe to be an advantage of cultural globalization. It has multiplied the interchange of ideas, music, art, language, and cultural ideals. On the other side of the debate, one common criticism of globalization is that it has enhanced wealth disparity and, further, that organizations of the Western world have benefited much more than those anywhere else. There is also the argument that globalization is improving standards of living worldwide as industrialization is expanding, but it is causing global warming and climate change, due to the greenhouse gases the factories emit. Additionally, in some areas it has led to the abuse and misuse of natural resources and caused other detrimental consequences.

How do these various globalization debates affect businesses? A successful company must be profitable to stay in business, but profitability is not the single key to success. A successful company must also consider the environment in which it operates—culturally, socially, environmentally, and economically—which requires companies to evolve and adjust as each of these environments changes. This evolution means that companies must continually evaluate themselves and their impact on all of their stakeholders, which include investors, creditors, management, employees, customers, governments, and, either directly or indirectly, the world. What companies used as measures of success forty years ago are different from the measures used twenty years ago, and those are different from those that are used today and still different from what will be needed in the future. Management accounting is the area in which many of these changing measures are either generated or evaluated. Such measures not only evaluate the cost effectiveness of products or services, but determine the best way to evaluate and reward employees and evaluate the cost-benefit of environmental protections, the impact of automation versus outsourcing, and the cost of training and educating employees.

ETHICAL CONSIDERATIONS

Global Ethics

In an article in *Business 2 Community*, Kate Gerasimova draws on her experience within the Russian and American business environments to discuss the role of ethics in global business endeavors. Ethics are the principles, and the values that underlie them, that allow us to determine what is right and wrong. According to Gerasimova, ethics fall into three categories: “code and compliance, destiny and values, and

social outreach."[8] In the global business context, she also emphasizes the importance of respecting differences in values held by coworkers, communicating honestly in business dealings, and building trust. To assist in the application of the organization's ethical approach to doing business in a different culture, it needs to develop a set of "core values as the basis for global policies and decision-making."[9] Gerasimova notes that organizations also need to consider that "clients and coworkers may have a different perspective on ethics and proper behavior than those to which you are accustomed." To address the different perspectives, an organization should train its employees to be culturally sensitive while balancing the need for rules and policies with the ability for employees to be flexible and to use their imagination.

Social Responsibility and Sustainability

What is **sustainability**, and what does it have to do with businesses? The United Nations definition is "the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs."[10] Usually, sustainability is viewed as having three components: economic, social, and environmental. Obviously, a business cannot continue into the future unless it is economically sound; however, if it maintains its economic status by depleting too many natural resources or paying illegal wages, then that company is not practicing good social responsibility.

Corporate social responsibility (CSR) is an organization's programs that evaluate and take responsibility for the organization's effects on environmental and social welfare. There are many aspects of corporate social responsibility, including the types, locations, and wages of the labor employed; the ways in which renewable and nonrenewable resources are utilized; how charitable organizations or local areas in which the company operates are helped; and setting corporate employee policies such as maternity and paternity leave that promote family well-being. Although the causes and cures of climate change are open to discussion, most will agree that everyone, including corporations, should do their part to avoid further damage and improve any negative impact on the environment.

CONCEPTS IN PRACTICE

Corporate Social Responsibility at New Belgium Brewing

As New Belgium Brewing Company states on their website: "We're New Belgium and we pollute. There. We said it. We are not perfect and we know it." But New Belgium Brewing has become a leader in sustainability. They preach it in every aspect of the company: production, marketing, employees, and customers. The company makes the point that being energy efficient is not only being environmentally responsible, it is being financially responsible through their "internal energy efficiency tax." The company uses many different metrics to track and improve its impact on the environment. For example,

8 Kate Gerasimova. "The Critical Role of Ethics and Culture in Business Globalization." *Business to Community*. September 29, 2016. https://www.business2community.com/strategy/critical-role-ethics-culture-business-globalization-01667737

9 Kate Gerasimova. "The Critical Role of Ethics and Culture in Business Globalization." *Business to Community*. September 29, 2016. https://www.business2community.com/strategy/critical-role-ethics-culture-business-globalization-01667737

10 "Sustainable Development." General Assembly of the United Nations. http://www.un.org/en/ga/president/65/issues/sustdev.shtml

the company measures its energy usage and taxes itself on energy consumption and then saves those internal tax dollars to implement further energy savings by installing new processes and techniques. They divert 99.9 percent of the waste from their brewery away from landfills. The company makes enough in recycling revenues to pay four salaries. These are just a few ways in which New Belgium Brewing faces the challenges of social responsibility. Read more at http://www.newbelgium.com/Sustainability/Environmental-Metrics.

In late 2016, the Paris Agreement (Paris Accord) brought together nations for the common cause of combatting climate change. There were 197 nations in attendance, and until recently, all 197 ratified or agreed to the effort. It requires all partners to pursue specific endeavors to keep the global temperature rise to 2 degrees Celsius above that of preindustrial levels. This would be accomplished by voluntarily reducing greenhouse gas emissions. In early 2017, US President Donald Trump announced that the United States would withdraw from the agreement. At that time, only Syria and Nicaragua were holdouts. Since then, both have signed the agreement, leaving the United States now as the lone holdout, although it will take several years for the formal withdrawal. In spite of the president's announcement, there have been representatives from cities, states, corporations, and universities around the United States that have pledged to continue with the agreement and meet the greenhouse gas emission targets as set out in the Paris Accord. Many of the corporations who have promised to move forward with reducing greenhouse gases have expressed that the Paris Accord expands markets for groundbreaking clean technologies and that it creates employment opportunities alongside economic growth.

In terms of managerial accounting, sustainable business practices create many issues. Organizations need to decide what elements will be measured. For example, minimizing electricity consumption, maximizing employee safety, or reducing greenhouse gases may be the biggest issue of concern for a company. Then, the company needs to determine ways of measurement that make sense regarding those items. Companies are becoming more aware of their impact on the world, and many are creating social responsibility reports in addition to their annual reports. This type of reporting requires different types of information and analysis than the typical financial measures gathered by companies. This is sometimes referred to as the *triple bottom line*, as it assesses an organization's performance not only relating to the profit, but also relating to the world and its people, and will be covered in Sustainability Reporting.

YOUR TURN

Zaley's Machining Division

Zaley is an aerospace manufacturing firm in the southwest United States. They manufacture several products used in the aviation and aerospace industry. The company has been steadily growing over the past ten years in both sales and personnel. The engineering and design team uses computerized aided drafting (CAD) to design the various products that are produced by the machining division.

The machining division recently implemented significant technological improvements by installing an advanced technique using hard-metal and aluminum high-speed machining. The following managers are involved with the machining division:

- Alex Freedman, technical specialist (supervises all computer programs)
- Emma Vlovski, sales manager (supervises all sales agents)
- Kayla McClaughley, cost accounting director (supervises all cost accountants)
- Mwangi Kori, lead test engineer (oversees all new-product testing and design)
- Torek Sanchez, production director (supervises all manufacturing employees)

Each of these managers needs information to make decisions needed to carry out the respective jobs.

Think about what might be involved in the job of each of these managers and the types of decisions they may be required to make in order to meet the goals of the company. What information would be needed by each of the managers?

Solution

Answers will vary. Sample answer:

- Alex Freeman, technical specialist (supervises all computer programs), needs information on the hours and type of usage possibly by department or by individual to ascertain if the equipment is being used effectively or if the programs used by the company are appropriate or additions or deletions need to be made. In addition, this information is needed to address how much and what type of staffing he needs in his department.
- Emma Vlovski, sales manager (supervises all sales agents), would want information about the level and type of sales for the company as a whole as well as for the individual sales agents. She would want to know which products are selling well, which ones are not, which sales agents are being the most successful, and why they are more successful than the others. Emma would also want information on how the agents are compensated, as this may be tied to the sales agent's efforts to meet sales goals.
- Kayla McClaughley, cost accounting director (supervises all cost accountants), would want to know what tasks the cost accountants perform, how much time they spend on these tasks, and whether there are any redundancies in workload so that improvements in efficiency can be made. If any of the accountants has certifications such as CPA or CMA, she would want to know if they are keeping their certifications current through continuing professional education.
- Mwangi Kori, lead test engineer (oversees all new-product testing and design), would need information on the efficiency and effectiveness of each of the products tested, including success and failure rates. She would want information on how well the policies and procedures for design changes are being followed and if those policies and procedures need updating or rewriting.
- Thomas Sanchez, production director (supervises all manufacturing employees), would want information on hours worked, pay rates, and training (past and ongoing) for the manufacturing employees. She would also want information on how each individual employee performs his or her role in the manufacturing environment. For example, are there particular employees who have fewer defects or down time in their part of the process than others?

Key Terms

automation method of using systems such as computers or robots to operate different processes, and machinery to improve efficiencies and lower direct labor costs

balanced scorecard tool used to evaluate performance using qualitative and nonqualitative measures

board of directors group of individuals elected by the shareholders of a company with the role of placing management, supervising management, and making key decisions on major issues of the company

bribery when an organization or representative of an organization gives money or other financial benefits to another individual, business, or official in order to gain favor or to manipulate a business decision

budget analyst someone who arranges and manages the master budget and compares master budget projections to actual results

cash-management accountant someone with responsibilities that include transferring monies between accounts, monitoring deposits and payments, reconciling cash balances, creating and tracking cash forecasts, and performing all other cash-related financial processes

Certified Financial Analyst (CFA) certification for a career in the finance and investment domains; requirements include a bachelor's degree or four years' experience and passing all three sections of the exam

Certified Fraud Examiner (CFE) signifies proven proficiency in fraud prevention, detection, and deterrence; requirements include bachelor's degree, two years of work-related experience, moral character references, and passing of four separate exams

Certified Government Auditing Professional (CGAP) designation exclusively for auditors employed throughout the public sector (federal, state, local); requirements are the same as for the CIA, but with a different exam

Certified Internal Auditor (CIA) credential offered by the Institute of Internal Auditors (IIA) and one of the only certifications accepted worldwide; requirements include a bachelor's degree, two years of work experience in a related field, and passing the three sections of the examination

Certified Management Accountant (CMA) certification for a specialist in corporate accounting management, including financial analytics, budgeting, and strategic assessment; requires a bachelor's degree, two years of work experience, and successfully passing both parts of the exam

Certified Public Accountant (CPA) top tier in accounting certifications; in the United States, each state has different educational and experience requirements, and certification requires passing the four-part CPA administered by the American Institute of Certified Public Accountants (AICPA)

chief executive officer (CEO) executive within a company with the highest ranking title who has the overall responsibility for the management of a company; reports to the board of directors

chief financial officer (CFO) corporation officer who reports to the CEO and oversees all of the accounting and finance concerns of a company

collaboration working in cross-functional teams and earning the trust and respect of colleagues in order to complete a task

commercial awareness knowing how a business is run and how it is influenced by the external environment, and knowing and understanding the overall industry within which the business is operating

continuous improvement ongoing effort to improve processes, products, services, and practices

controller financial officer of a corporation reporting to the CFO who is responsible for an organization's accounting records, financial statements, tax returns, and internal reporting

controlling monitoring of the planning objectives that were put into place

corporate social responsibility (CSR) actions that firms take to assume responsibility for their impact on the

environment and social well-being

cost accountant employee who amasses large sums of data, checking for accuracy and then formulating the cost of raw materials, work in process, finished goods, labor, overhead, and other associated manufacturing costs

effective communication conveying information in both written and oral forms in a way that the intended audience can understand

Enrolled Agent (EA) credential focusing on a career in taxation; created by the IRS to signify significant knowledge of the US tax code and the ability to apply the concepts of that code

enterprise resource planning (ERP) system that helps a company streamline its operations and helps management respond quickly to change

evaluating comparing actual results against the planned results

external user someone who relies on the financial statements and annual reports to access information about a company in order to make more informed decisions (e.g., creditor, tax authority and regulator, investor, customer, competitor, and others)

Financial Accounting Standards Board (FASB) independent, nonprofit organization that sets financial accounting and reporting standards for both public and private sector businesses in the United States that use Generally Accepted Accounting Principles (GAAP)

financial analyst someone who assists in preparing budgets and tracking actual costs, and performs other tasks that support other management personnel in organizing forecasts and projections

Foreign Corrupt Practices Act (FCPA) law that specifically prohibits payments to foreign government officials to aid in attaining or retaining business and requires a company to have good internal controls so a slush fund to pay bribes cannot be created and maintained

generally accepted accounting principles (GAAP) common set of rules, standards, and procedures that publicly traded companies must follow when composing their financial statements

globalization development of business through international influence, or extending social and cultural aspects around the world

goal what a company expects to accomplish over time

government agency found at all levels of government: federal, state, county, city, and so on; includes military, law enforcement, airports, and school systems

Institute of Management Accountants (IMA) professional organization for management accountants that provides research, education, a means of knowledge sharing, and practice development to its members

intangible good good with financial value but no physical presence; examples include copyrights, patents, goodwill, and trademarks

internal auditor employee of an organization whose job is to provide an independent and objective evaluation of the company's accounting and operational activities

internal user someone inside the company or organization who is responsible for managing the company’s business interests and executing decisions (e.g., all levels of management, owner, and other employees)

just-in-time (JIT) manufacturing inventory system that companies use to increase efficiency and decrease waste by receiving goods only as they are needed within the production process, thereby reducing warehousing costs

kaizen another process that is often linked to Six Sigma and is designed for continuous improvement by eliminating waste and increasing efficiencies; a Japanese word meaning *change for the better*

lean business model one in which a company strives to eliminate waste in its products, services, and processes, while still fulfilling the company’s mission

Lean Six Sigma (LSS) quality control program that depends on a combined effort of many team members to enhance performance by analytically removing waste and diminishing variations between products

managerial accounting process that allows decision makers to set and evaluate business goals by

determining what information they need to make a particular decision and how to analyze and communicate this information

mission statement short statement of a company's purpose and focus

monetary accounting information relating to money or currency

nonmonetary accounting information not relating to money or currency, such as the quantity of materials, number of employees, number of hours worked, and so forth

nonprofit (not-for-profit) organization tax-exempt organization that serves its community in a variety of areas

objective target that needs to be met in order to meet company goals

outsourcing act of using another company to provide goods or services that your company requires

planning process of setting goals and objectives

radio-frequency identification (RFID) technology that uses electromagnetic fields to routinely identify and trace inventory tags that have been attached to objects

Sarbanes-Oxley Act (SOX) federal law that regulates business practices; intended to protect investors by enhancing the accuracy and reliability of corporate financial statements and disclosures through governance guidelines including sanctions for criminal conduct

strategic planning setting priorities and determining how to allocate corporate resources to help an organization accomplish short-term and long-term goals

sustainability meeting the needs of the present generation without compromising the ability of future generations to meet their own needs by being aware of current economic, social, and environmental impacts

tangible good physical good that customers can handle and see

theory of constraints (TOC) process of recognizing and removing bottlenecks within the value chain that may be limiting an organization's profitability

total quality management (TQM) process in which management and employees look to reveal waste and errors, streamline the supply chain, improve customer relations, and confirm that employees are informed and properly trained

treasurer financial officer of a corporation reporting to the CFO who is in control of the finance side of the business (cash position, corporation funds)

whistleblower someone who provides evidence of fraud

Summary

1.1 Define Managerial Accounting and Identify the Three Primary Responsibilities of Management

- The purpose of managerial accounting is to supply financial and nonfinancial information to the organization's management and other internal decision makers.
- Most of the job responsibilities of a manager fit into one of three categories: planning, controlling, and evaluating.
- Planning involves setting goals and forming the plans to achieve those goals.
- Controlling involves the day-to-day activities. Its purpose is to help in planning functions and to facilitate coordination within the organization.
- Evaluation determines whether plans are being followed and whether progress is being made as planned toward the fulfillment of organizational goals and objectives. It also involves taking corrective measures in case of deviations identified in the course of action.

1.2 Distinguish between Financial and Managerial Accounting

- Managerial accounting provides information to managers and other users within the company. It has a specific focus, and the information is detailed and timely.
- Financial accounting follows the guidelines of the GAAP, set in place by the FASB and, in many cases, by the SEC. Managerial accounting is much more flexible and does not have to follow specific rules or guidelines.
- There are seven key differences between managerial accounting and financial accounting: users, types of reports produced, frequency of producing the reports, purpose of the information produced, focus of the reporting information, nature of the original information used to produce the reports, and verification of the data used to create the reports.

1.3 Explain the Primary Roles and Skills Required of Managerial Accountants

- Essential skills for managerial accountants include commercial awareness, collaboration, effective communication skills, strong technology talents, extensive analytical abilities, and elevated ethical values.
- Management accountants work with individuals at all levels of an organization from the CEO to the shop floor workers.
- There are many different career paths management accountants can take to work in corporations, government entities, service firms, or nonprofit organizations.
- There are numerous certifications that accountants can earn to improve their careers and set themselves apart from their peers.

1.4 Describe the Role of the Institute of Management Accountants and the Use of Ethical Standards

- Many professional organizations share resources, such as education, research, and practice development, with their members. They also enforce a code of ethics for their members.
- All employees within a company are expected to act ethically within their business actions. This can sometimes be difficult when the company almost promotes the idea of unethical actions.
- In response to several corporate scandals, the United States Congress passed the Sarbanes-Oxley Act of 2002 (SOX).
- Ethical codes can be helpful guidelines, but the rationale to act ethically must originate from within oneself, from personal morals and values. There are steps that provide an outline for examining ethical issues.
- One of the issues with ethics is that what one person, community, or even country considers unethical or wrong, another person, community, or country may have no problem with and see it as just a way of doing business.
- The Foreign Corrupt Practices Act of 1977 specifically prohibits payments to foreign government officials to aid in attaining or retaining business. This provision applies to all US persons and foreign firms acting within the United States.

1.5 Describe Trends in Today’s Business Environment and Analyze Their Impact on Accounting

- Business regulations are always being altered, global competition continues to increase, and technology provides continual disruption. Management accounting must keep up with the changes in the business environment.
- The fundamental difference between manufacturing organizations and service-based firms is whether the organizations produce a tangible product.
- Business entities have been in the lead for using technology, but they must continue to adjust quickly with the ever-advancing business technology.
- ERP systems help companies streamline their operations and help management respond quickly to change.

- Lean manufacturing, which was started in Japan by automakers, is now a widely used practice that attempts to increase productivity and eliminate waste.
- The philosophy of continuous improvement has led organizations to adopt practices such as TQM, JIT manufacturing, and LSS.
- The balanced scorecard approach uses both financial and nonfinancial measures in evaluating all attributes of the organization's procedures.
- Globalization has expanded competitive borders, giving customers and companies more alternatives.
- Many companies have started to assess their corporation not only on financial profits, but also on their corporate social responsibility.

Multiple Choice

1. LO 1.1 The managers of an organization are responsible for performing several broad functions. They are _____.

A. planning, controlling, and selling
B. directing, controlling, and evaluating
C. planning, evaluating, and manufacturing
D. planning, controlling, and evaluating

2. LO 1.1 Management accountants help the management of an organization in their planning function through _____.

A. monitoring anti-theft systems
B. strategic planning
C. evaluating costs
D. analyzing profits

3. LO 1.1 Which of the following is a primary aspect of the evaluating function within an organization?

A. comparing actual results against expected results for products, departments, divisions, or the company as a whole
B. reviewing only the quantitative or financial results of the company
C. setting goals
D. putting controls in place for the upcoming year

4. LO 1.1 During the control function, the measurements taken of the performance must be accurate enough to see _____.

A. only positive results
B. deviations and variances
C. the primary focus
D. only the negative results

5. LO 1.1 Which of the following is **false** regarding strategic planning?

A. It is the sole responsibility of supervisors.
B. It will span many years.
C. It should include both short-term and long-term goals.
D. Strategic objectives will be diverse and vary from company to company.

6. LO 1.2 Managerial accounting produces information:
- A. to meet the needs of external users
- B. that is often focused on the future
- C. to meet the needs of investors
- D. that follows the rules of GAAP

7. LO 1.2 Management accounting:
- A. emphasizes special-purpose information
- B. relates to the company as a whole
- C. is limited to strictly cost figures
- D. is controlled by GAAP

8. LO 1.2 Internal users of accounting information would *not* include _____.
- A. managers
- B. employees
- C. creditors
- D. officers

9. LO 1.2 External users of accounting information would include _____.
- A. employees
- B. managers
- C. investors
- D. supervisors

10. LO 1.2 Which of the following statements is **incorrect**?
- A. The practice of management accounting is fairly flexible.
- B. The information gathered from management accounting is not required by law.
- C. Management accounting focuses mainly on the internal user.
- D. Reports produced using management accounting must follow GAAP.

11. LO 1.3 The stockholders of a company are:
- A. the owners
- B. policy setters
- C. responsible and liable for the financial well-being of the company
- D. operating within the company as independent shareholders

12. LO 1.3 The controller of a corporation:
- A. reports to the CFO and is in charge of the finance side of the business
- B. reports to the CFO and is in charge of the accounting side of the business
- C. reports to the CEO and implements all cash policies
- D. reports to the board of directors

13. LO 1.3 The Certified Financial Analyst (CFA) certification:
- A. only requires a high school diploma
- B. is administered by the AICPA
- C. consists of three separate exams that must be taken in succession
- D. is the most popular certification among accountants in the United States

14. LO 1.3 The Certified Management Accountant (CMA) certification:

A. signifies someone specializing in tax accounting
B. requires an associate's degree and four years of work experience
C. includes a two-part exam, education requirements, and a work experience requirement
D. is offered to managers who take special courses in accounting

15. LO 1.3 Which of the following terms means the ability to work in cross-functional teams in order to complete a task?

A. supervisory skills
B. conceptualization
C. collaboration
D. resource planning

16. LO 1.3 Which of the following terms means knowing how a business is run and how it is influenced by external forces, and knowing and understanding the overall industry?

A. commercial awareness
B. conceptualization
C. collaboration
D. imagination

17. LO 1.4 What is the law that protects investors from fraudulent financial accounting activity?

A. FASB
B. SACS
C. SOX
D. CPAS

18. LO 1.4 What year was the Sarbanes-Oxley Act enacted?

A. 2007
B. 1992
C. 1997
D. 2002

19. LO 1.4 When a representative of an organization gives money to another business official in order to gain favor and/or manipulate a business decision, this is known as _____.

A. whistleblowing
B. bribery
C. buyer debits
D. face value

20. LO 1.4 The law that specifically prohibits payments to foreign officials in order to attain business is knowns as _____.

A. FCPA
B. AICPA
C. SOX
D. IFRS

21. LO 1.4 Which of the following is *not* a step in the outline for examining ethical issues?

A. Establish the facts of the situation.
B. Evaluate each course of action.
C. Make a decision.
D. Confirm decision with FASB.

22. LO 1.5 Which of the following is *not* an objective used in the balanced scorecard approach?

A. Customer
B. Financial
C. Vendor
D. Learning and growth

23. LO 1.5 Which of the following is *not* true regarding continuous improvement?

A. It applies to both service and manufacturing companies.
B. It is used to reduce performance costs.
C. It rejects the idea of "good enough."
D. It can be applied only to improve processes and products but not services and practices.

24. LO 1.5 A company's attempts to utilize sustainable business practices with regard to its employees, the environment, and society are known as _____.

A. a balanced scorecard
B. corporate social responsibility
C. total quality management
D. value chain

25. LO 1.5 A process that is often linked to Six Sigma and is designed toward continuous improvement by eliminating waste is _____.

A. kamikaze
B. value chain
C. total quality management
D. kaizen

26. LO 1.5 An inventory system that organizations use to increase efficiency and decrease waste is _____.

A. corporate social responsibility
B. just-in-time manufacturing
C. total quality management
D. Lean Six Sigma

27. LO 1.5 A quality control program that depends on multiple team members for removing waste and diminishing defects within products is _____.

A. kaizen
B. total quality management
C. Lean Six Sigma
D. a balanced scorecard

Questions

1. LO 1.1 Carlita believes an important part of the planning process for managers is being sure to position the company to achieve its goals. She thinks that positioning is an extensive concept and can depend on the right information and that managerial accountants assist in positioning the company. Is she correct? Explain.

2. LO 1.1 What are some activities and tasks a manager might perform when engaging in the controlling function of management responsibilities?

3. LO 1.1 If there are deviations from the stated goals and objectives, what steps can managers take to get back on track? Provide at least two specific examples.

4. LO 1.1 Explain how managerial accountants help managers plan, control, and evaluate.

5. LO 1.1 How do the subject matter of reports and the verification of reports differ between financial accounting and managerial accounting?

6. LO 1.2 What is the purpose of management accounting?

7. LO 1.2 Who are the primary users of the information gathered by managerial accountants?

8. LO 1.2 What are the key differences between financial accounting and managerial accounting?

9. LO 1.3 Other than accounting skills, what six qualities must be prevalent in a managerial accountant?

10. LO 1.3 Explain how having more than one of the accounting credentials would be beneficial to an accounting career.

11. LO 1.3 Briefly discuss the chain of command for someone being hired into an organization as a staff managerial accountant.

12. LO 1.3 According to the information available at http://www.accounting.com/careers/, what are six different areas of accounting on which you can focus your career?

13. LO 1.3 According to the information on management accounting available at http://www.accounting.com/careers/, what are some areas of specialization?

14. LO 1.3 Go to http://www.accounting.com/careers/ and look up your state to find projected job growth and projected salaries.

15. LO 1.4 What other professional business organizations have a code of ethics?

16. LO 1.4 How can having a bonus system based purely on sales goals create an environment that encourages unethical behavior?

17. LO 1.4 What led to the United States Congress passing the public accounting reform act called Sarbanes-Oxley?

18. LO 1.5 What is an enterprise resource planning (ERP) system? What are the principal benefits of such a system?

19. LO 1.5 Describe what is meant by the term “balanced” in the term *balanced scorecard method*.

20. LO 1.5 What is corporate social responsibility, and who are the stakeholders?

Exercise Set A

EA1. LO 1.2 Indicate whether each statement describes financial accounting or managerial accounting.

A. The information is directed at external users who are making decisions pertaining to investing, extending credit, and other decisions.
B. The principal users are the organization's managers.
C. The key focus is on the entity as a whole.
D. The rules and principles are very flexible.
E. The information gathered is usually available after an independent audit has been completed.

EA2. LO 1.2 Identify the following as True or False:

A. Managerial accounting reports must comply with the rules set in place by the FASB.
B. Financial accounting reports are typically general-purpose reports.
C. Financial accounting reports pertain to the entity as a whole, whereas managerial accounting focuses more on subunits of the organization.
D. The main users of the financial accounting information are the internal users.
E. Managerial reports are prepared on an as-needed basis.
F. Financial accounting reports often must be audited at least annually by an independent auditor.

EA3. LO 1.2 Define each of these users of accounting information as an internal user of external user:

A. Management
B. Employees
C. Investors
D. Creditors
E. Customers
F. Tax authorities

EA4. LO 1.2 Discuss what information would be most useful for these users of accounting information:

A. Management
B. Employees
C. Investors
D. Creditors
E. Customers
F. Tax authorities

EA5. LO 1.3 Taylor Speedy has prepared the following list of statements about managerial accounting, financial accounting, and the functions of management. Identify each statement as true or false.

A. Financial accounting centers on providing information to internal users.
B. Staff positions are directly involved in the company's primary revenue-generating activities.
C. Preparation of budgets is part of financial accounting.
D. Managerial accounting applies only to merchandising and manufacturing companies.
E. Both managerial accounting and financial accounting deal with many of the same economic events.

EA6. LO 1.3 Match the term with the description:

A. Certified Public Accountant	i. Specialist in corporate accounting management; favors financial analytics, budgeting, and strategic domains
B. Certified Financial Analyst	ii. Considered the top tier in accounting certifications; must pass a four-part exam, with education and work experience requirements
C. Certified Management Accountant	iii. Designation that is exclusively for auditors of the public sector
D. Certified Internal Auditor	iv. Credential for auditors who work within organizations and is one of a few that is accepted worldwide
E. Certified Fraud Examiner	v. Certification for those with a career in finance and investment areas
F. Certified Government Auditing Professional	vi. Designation that proves proficiency in fraud prevention, detection, and deterrence

EA7. LO 1.4 After the passage of the Sarbanes-Oxley Act in 2002, many new responsibilities were put into place for organizations and their management. What are the four significant issues that were addressed by the act and its provisions as presented in this chapter? How does the act and its various requirements help deter fraudulent activity?

EA8. LO 1.4 Indicate whether each of the following statements is true or false.

A. Bribery in the world of business typically happens when an organization or representative of an organization gives financial benefits to an official to gain favor or manipulate a business decision.
B. The Foreign Corrupt Practices Act was implemented in the aftermath of disclosures that businesses were violating the IMA Code of Ethics.
C. Managers are required to follow specific rules issued by the IMA for internal financial reporting.
D. Ethics is more than obeying laws.
E. The Sarbanes-Oxley Act addressed public company accounting reform.

EA9. LO 1.5 Match each lean business method to the best description:

A. Just-in-time manufacturing	i. The focus is on quality throughout the entire process.
B. Continuous improvements	ii. Inventory is attained or produced only as needed.
C. Total quality management	iii. A combined effort of team members is used to eliminate waste and defects.
D. Lean Six Sigma	iv. All managers and employees are always looking for ways to improve operations.

EA10. LO 1.5 For each of the activities listed, choose the manufacturing concept that applies: (i) just-in-time inventory, (ii) continuous improvement, or (iii) total quality management.

A. A company receives inventory daily based on customer orders.
B. Manufacturing factories have been arranged in such a fashion to reduce inefficiencies.
C. Companies organize customer focus groups in order to look at customer needs and expectations.
D. The entire production process is standardized and written down with procedures.
E. Each customer receives a survey of satisfaction with their product.
F. All orders are complete and shipped within three business days.

EA11. LO 1.5 Look up the definitions for the following terms:

A. Budget (Budgeting)
B. Capital budget (Capital Budgeting Decisions)
C. Balanced scorecard (Balanced Scorecard and Other Performance Measures)
D. Break-Even point (Cost Volume Profit Analysis)

Provide examples of how each of these terms is used in your own life and how using these practices is useful.

Exercise Set B

EB1. LO 1.2 Indicate whether the statement describes reporting by the financial accounting function or the managerial accounting function of an organization.

A. The users of the report are managers who need a daily summary of work done each shift.
B. The report is a job cost sheet for jobs completed in a 24-hour period.
C. The annual report is released each year on the company's website.
D. The report is audited by the company's certified public accountant firm.
E. The report is prepared every day because the customer service manager needs information about inventory ready to be shipped to customers.

EB2. LO 1.2 Identify the following as true or false:

A. Financial accounting reports are *not* released to external users.
B. Managerial accounting reports are *not* used by employees inside the organization.
C. Managerial accounting reports include only monetary information.
D. Financial accounting reports are monetary in nature.
E. If a result of a company's operations is nonmonetary in nature, it must be converted to monetary units for managerial reporting.
F. Tax authorities and government regulatory agencies are external users of financial information.

EB3. LO 1.2 Companies need to report both monetary and nonmonetary data and information.

A. Define these two terms and provide examples of each.
B. Discuss what sources are available that provide companies with both types of data and information.

EB4. LO 1.3 Marvin has been thinking about the fields of managerial and financial accounting and the functions of management within an organization. He has the following list of statements to understand. Identify them as true or false.

A. Managerial accounting reports are prepared only quarterly and annually.
B. Financial accounting reports are general-purpose reports.
C. Managerial accounting reports pertain to subunits of the business.
D. Managerial accounting reports must comply with GAAP.
E. The company treasurer reports directly to the vice president of operations.

EB5. LO 1.3 Match the term with the description.

A. Chief Executive Officer	i. has responsibilities that include transferring monies between accounts and monitoring deposits
B. Chief Financial Officer	ii. the corporation officer who has the overall responsibility of the management of a company
C. Enrolled Agent	iii. a corporate officer who reports to the chief executive officer and oversees all of the accounting and finance concerns of a company
D. Cash Management Accountant	iv. the financial officer of a corporation reporting to the chief financial officer who is responsible for the accounting records and financial statements
E. Controller	v. credential focusing on a career in taxation created by the IRS to signify significant knowledge of the US tax code
F. Financial Analyst	vi. Someone who assists in preparing budgets, tracking actual costs and performs other tasks that support other management personnel in organizing forecasts and projections

EB6. LO 1.4 The Foreign Corrupt Practices Act (FCPA) was implemented in 1977. Why was it enacted, and what are its major provisions?

EB7. LO 1.4 Indicate whether each of the following statements is true or false.

A. Section 302 of Sarbanes-Oxley requires the CEO and CFO to review all financial reports and sign the reports.
B. One of the three questions put forth by the Institute of Business Ethics is “Do I mind others knowing what I have done?”
C. Ethical issues may be faced on a small scale, such as making a business decision to produce excess inventory for the sole purpose of trying to influence managers’ bonuses.
D. A manager who spends excess budgeted funds remaining at the end of a fiscal year on unnecessary expenditures thinking that it is better to “use it than lose it” is acting ethically.
E. The Foreign Corrupt Practices Act was implemented in 2001 to protect investors by enhancing the accuracy and reliability of corporate financial statements and disclosures.

Thought Provokers

TP1. LO 1.1 Table 1.3 shows how different areas within the business world use the information from managerial accountants. Think of the ways that the events coordinator for the United Way (a nonprofit charitable organization) would use each area (planning, controlling, and evaluation).

TP2. LO 1.1 There are individuals who are under the impression that managerial accounting provides services mainly for manufacturing organizations. Are they correct? Explain.

TP3. LO 1.3 Think about the organization chart in Figure 1.7. Describe ways in which each of the accounting and managerial functions might overlap and complement each other.

TP4. LO 1.4 Controversy tends to surround the topic of whistleblowers. For example, should they be considered heroes or traitors? Many pro-whistleblowing policies have been enacted by the federal government to allow these individuals to reap significant monetary rewards for coming forward and giving information about behaviors and actions such as corporate fraud and unethical deeds. Many corporate whistleblowers face negative consequences of their actions, such as reassignment, revenge, and hate crimes, and are seen as traitors (e.g., Edward Snowden and Gina Gray). Yet Sherron Watkins and Cynthia Cooper were celebrated as heroes. Look up the stories of Sherron Watkins and Cynthia Cooper. Why do you think that some whistleblowers are vilified and others made to be heroes?

2

Building Blocks of Managerial Accounting

Figure 2.1 Building Blocks of Managerial Accounting. How costs behave and how managers can estimate future costs are the building blocks of managerial accounting. (credit: modification of "Blocks" by "Hey Paul"/Flickr, CC BY 2.0)

Chapter Outline

LO **2.1** Distinguish between Merchandising, Manufacturing, and Service Organizations

LO **2.2** Identify and Apply Basic Cost Behavior Patterns

LO **2.3** Estimate a Variable and Fixed Cost Equation and Predict Future Costs

Why It Matters

Many 16-year-olds in the United States eagerly anticipate having a car of their own and the freedom that comes from having their own means of transportation. For many, this means not having to bum a ride from a friend, take a bus, hire Uber or Lyft, or worse, borrow the parents' car. However, as appealing as having one's own set of wheels sounds, it comes with an array of costs that many young drivers do not anticipate. Some of the costs associated with buying and owning a car are fixed, and some vary with the level of activity. For example, a driver pays car payments and insurance premiums every month whether or not the car is driven, but the cost of maintenance and gas can be controlled by driving less. A driver cannot control the price of gasoline or the mechanic's hourly wage but can control how much of each is used each month.

Just as car owners incur a variety of costs—fixed, variable, controllable, and uncontrollable—businesses incur these types of costs as well. The goal of managerial accountants is to use this cost information to assist management in both long- and short-term decision-making. Managerial accounting follows standards and best practices for reporting cost data that are less formal than those used for financial accounting. This means management often has the discretion to determine how costs are used internally.

Since businesses collect and analyze cost data for internal use, there may be distinct differences among

businesses in how they estimate and treat certain costs. What does not change, regardless of how cost data is used, are generally agreed upon cost classifications managers use for decision-making. In short, most businesses incur the same *type* of costs, but how each firm classifies and manages these costs can vary widely.

2.1 Distinguish between Merchandising, Manufacturing, and Service Organizations

Most businesses can be classified into one or more of these three categories: manufacturing, merchandising, or service. Stated in broad terms, manufacturing firms typically produce a product that is then sold to a merchandising entity (a retailer) For example, Proctor and Gamble produces a variety of shampoos that it sells to retailers, such as Walmart, Target, or Walgreens. A service entity provides a service such as accounting or legal services or cable television and internet connections.

Some companies combine aspects of two or all three of these categories within a single business. If it chooses, the same company can both produce and market its products directly to consumers. For example, Nike produces products that it directly sells to consumers and products that it sells to retailers. An example of a company that fits all three categories is Apple, which produces phones, sells them directly to consumers, and also provides services, such as extended warranties.

Regardless of whether a business is a manufacturer of products, a retailer selling to the customer, a service provider, or some combination , all businesses set goals and have strategic plans that guide their operations. Strategic plans look very different from one company to another. For example, a retailer such as Walmart may have a strategic plan that focuses on increasing same store sales. Facebook's strategic plan may focus on increasing subscribers and attracting new advertisers. An accounting firm may have long-term goals to open offices in neighboring cities in order to serve more clients. Although the goals differ, the process all companies use to achieve their goals is the same. First, they must develop a plan for how they will achieve the goal, and then management will gather, analyze, and use information regarding costs to make decisions, implement plans, and achieve goals.

Table 2.1 lists examples of these costs. Some of these are similar across different types of businesses; others are unique to a particular business.

Costs

Type of Business	Costs Incurred
Manufacturing Business	• Direct labor • Plant and equipment • Manufacturing overhead • Raw materials
Merchandising Business	• Lease on retail space • Merchandise inventory • Retail sales staff

Table 2.1 Some costs, such as raw materials, are unique to a particular type of business. Other costs, such as billing and collections, are common to most businesses, regardless of the type.

Costs	
Type of Business	**Costs Incurred**
Service Business	• Billing and collections • Computer network equipment • Professional staff

Table 2.1 Some costs, such as raw materials, are unique to a particular type of business. Other costs, such as billing and collections, are common to most businesses, regardless of the type.

Knowing the basic characteristics of each cost category is important to understanding how businesses measure, classify, and control costs.

Merchandising Organizations

A merchandising firm is one of the most common types of businesses. A **merchandising firm** is a business that purchases finished products and resells them to consumers. Consider your local grocery store or retail clothing store. Both of these are merchandising firms. Often, merchandising firms are referred to as *resellers* or *retailers* since they are in the business of reselling a product to the consumer at a profit.

Think about purchasing toothpaste from your local drug store. The drug store purchases tens of thousands of tubes of toothpaste from a wholesale distributor or manufacturer in order to get a better per-tube cost. Then, they add their mark-up (or profit margin) to the toothpaste and offer it for sale to you. The drug store did not manufacture the toothpaste; instead, they are reselling a toothpaste that they purchased. Virtually all of your daily purchases are made from merchandising firms such as Walmart, Target, Macy's, Walgreens, and AutoZone.

Merchandising firms account for their costs in a different way from other types of business organizations. To understand merchandising costs, Figure 2.2 shows a simplified income statement for a merchandising firm:

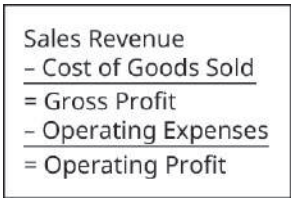


Figure 2.2 Simplified Income Statement for a Merchandising Firm. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

This simplified income statement demonstrates how merchandising firms account for their sales cycle or process. *Sales revenue* is the income generated from the sale of finished goods to consumers rather than from the manufacture of goods or provision of services. Since a merchandising firm has to purchase goods for resale, they account for this cost as *cost of goods sold*—what it cost them to acquire the goods that are then sold to the customer. The difference between what the drug store paid for the toothpaste and the revenue generated by selling the toothpaste to consumers is their *gross profit*. However, in order to generate sales revenue, merchandising firms incur expenses related to the process of operating their business and selling the merchandise. These costs are called *operating expenses*, and the business must deduct them from the gross

profit to determine the *operating profit*. (Note that while the terms "operating profit" and "operating income" are often used interchangeably, in real-world interactions you should confirm exactly what the user means in using those terms.) Operating expenses incurred by a merchandising firm include insurance, marketing, administrative salaries, and rent.

Figure 2.3 Shopping Mall. Merchandising firms must identify and manage their costs to remain competitive and attract customers to their business. (credit: "stairs shopping mall" by "jarmoluk"/Pixabay, CC0)

CONCEPTS IN PRACTICE

Balancing Revenue and Expenses

Plum Crazy is a small boutique selling the latest in fashion trends. They purchase clothing and fashion accessories from several distributors and manufacturers for resale. In 2017, they reported these revenue and expenses:

Rent	$12,000	Sales revenue	$150,000
Advertising	4,000	Cost of goods sold	60,000
Utilities	1,500	Supplies	3,000
Salaries and wages	35,000	Miscellaneous	1,200

Before examining the income statement, let's look at Cost of Goods Sold in more detail. Merchandising companies have to account for inventory, a topic covered in Inventory (http://cnx.org/content/m67888/latest/) . As you recall, merchandising companies carry inventory from one period to another. When they prepare their income statement, a crucial step is identifying the actual cost of goods that were sold for the period. For Plum Crazy, their Cost of Goods Sold was calculated as shown in Figure 2.4.

PLUM CRAZY Cost of Goods Sold For the Year Ended December 31, 2017	
Beginning Merchandise Inventory	$ 23,500
+ Purchases	115,000
Goods Available for Sale	138,500
– Ending Merchandise Inventory	(78,500)
Cost of Goods Sold	$ 60,000

Figure 2.4 Plum Crazy's Cost of Goods Sold Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Once the calculation of the Cost of Goods Sold has been completed, Plum Crazy can now construct their income statement, which would appear as shown in Figure 2.5.

PLUM CRAZY Income Statement For the Year Ended December 31, 2017		
Sales Revenue		$150,000
Cost of Goods Sold		60,000
Gross Profit		90,000
Advertising	$ 4,000	
Rent	12,000	
Salaries and Wages	35,000	
Supplies	3,000	
Utilities	1,500	
Miscellaneous	1,200	
Operating Expenses	56,700	56,700
Net Income		$ 33,300

Figure 2.5 Plum Crazy's Income Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Since merchandising firms must pass the cost of goods on to the consumer to earn a profit, they are extremely cost sensitive. Large merchandising businesses like Walmart, Target, and Best Buy manage costs by buying in bulk and negotiating with manufacturers and suppliers to drive the per-unit cost.

CONTINUING APPLICATION AT WORK

Introduction to the Gearhead Outfitters Story

Gearhead Outfitters, founded by Ted Herget in 1997 in Jonesboro, AR, is a retail chain which sells outdoor

gear for men, women, and children. The company's inventory includes clothing, footwear for hiking and running, camping gear, backpacks, and accessories, by brands such as The North Face, Birkenstock, Wolverine, Yeti, Altra, Mizuno, and Patagonia. Ted fell in love with the outdoor lifestyle while working as a ski instructor in Colorado and wanted to bring that feeling back home to Arkansas. And so, Gearhead was born in a small downtown location in Jonesboro. The company has had great success over the years, expanding to numerous locations in Ted's home state, as well as Louisiana, Oklahoma, and Missouri.

While Ted knew his industry when starting Gearhead, like many entrepreneurs he faced regulatory and financial issues which were new to him. Several of these issues were related to accounting and the wealth of decision-making information which accounting systems provide.

For example, measuring revenue and expenses, providing information about cash flow to potential lenders, analyzing whether profit and positive cash flow is sustainable to allow for expansion, and managing inventory levels. Accounting, or the preparation of financial statements (balance sheet, income statement, and statement of cash flows), provides the mechanism for business owners such as Ted to make fundamentally sound business decisions.

LINK TO LEARNING

Walmart is inarguably a retail giant, but how did the company become so successful? Read the article about how low costs have allowed Walmart to keep prices low while still making a large profit (https://openstax.org/l/50Walmart) to learn more.

Manufacturing Organizations

A **manufacturing organization** is a business that uses parts, components, or raw materials to produce finished goods (Figure 2.6). These finished goods are sold either directly to the consumer or to other manufacturing firms that use them as a component part to produce a finished product. For example, Diehard manufactures automobile batteries that are sold directly to consumers by retail outlets such as AutoZone, Costco, and Advance Auto. However, these batteries are also sold to automobile manufacturers such as Ford, Chevrolet, or Toyota to be installed in cars during the manufacturing process. Regardless of who the final consumer of the final product is, Diehard must control its costs so that the sale of batteries generates revenue sufficient to keep the organization profitable.

Figure 2.6 Manufacturing firms apply direct labor to raw materials in order to produce the finished goods purchased from retailers. (credit: "work manufactures" by "dodaning0"/Pixabay, CC0)

Manufacturing firms are more complex organizations than merchandising firms and therefore have a larger variety of costs to control. For example, a merchandising firm may purchase furniture to sell to consumers, whereas a manufacturing firm must acquire raw materials such as lumber, paint, hardware, glue, and varnish that they transform into furniture. The manufacturer incurs additional costs, such as direct labor, to convert the raw materials into furniture. Operating a physical plant where the production process takes place also generates costs. Some of these costs are tied directly to production, while others are general expenses necessary to operate the business. Because the manufacturing process can be highly complex, manufacturing firms constantly evaluate their production processes to determine where cost savings are possible.

CONCEPTS IN PRACTICE

Cost Control

Controlling costs is an integral function of all managers, but companies often hire personnel to specifically oversee cost control. As you've learned, controlling costs is vital in all industries, but at Hilton Hotels, they translate this into the position of Cost Controller. Here is an excerpt from one of Hilton's recent job postings.

Position Title: Cost Controller

Job Description: "A Cost Controller will work with all Heads of Departments to effectively control all products that enter and exit the hotel."[1]

Job Requirements:

"As Cost Controller, you will work with all Heads of Departments to effectively control all products that enter and exit the hotel. Specifically, you will be responsible for performing the following tasks to the highest standards:

- Review the daily intake of products into the hotel and ensure accurate pricing and quantity of goods received
- Control the stores by ensuring accuracy of inventory and stock control and the pricing of goods received
- Alert relevant parties of slow-moving goods and goods nearing expiry dates to reduce waste and alter product purchasing to accommodate
- Manage cost reporting on a weekly basis
- Attend finance meetings, as required
- Maintain good communication and working relationships with all hotel areas
- Act in accordance with fire, health and safety regulations and follow the correct procedures when required"[2]

As you can see, the individual in this position will interact with others across the organization to find ways to control costs for the benefit of the company. Some of the benefits of cost control include:

- Lowering overall company expenses, thereby increasing net income.
- Freeing up financial resources for investment in research & development of new or improved products, goods, or services
- Providing funding for employee development and training, benefits, and bonuses
- Allowing corporate earnings to be used to support humanitarian and charitable causes

Manufacturing organizations account for costs in a way that is similar to that of merchandising firms. However, as you will learn, there is a significant difference in the calculation of cost of goods sold. Figure 2.7 shows a simplification of the income statement for a manufacturing firm:

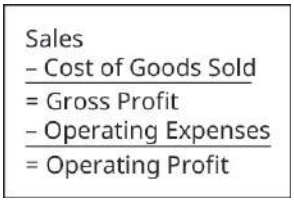


Figure 2.7 Simplified Income Statement for a Manufacturing Firm. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

At first it appears that there is no difference between the income statements of the merchandising firm and the manufacturing firm. However, the difference is in how these two types of firms account for the cost of goods sold. Merchandising firms determine their cost of goods sold by accounting for both existing inventory and new purchases, as shown in the Plum Crazy example. It is typically easy for merchandising firms to calculate their costs because they know exactly what they paid for their merchandise.

1 Hilton. "Cost Controller: Job Description." Hosco. https://www.hosco.com/en/job/hilton-istanbul-bomonti-hotel-conference-center/cost-controller

2 Hilton. "Cost Controller: Job Description." Hosco. https://www.hosco.com/en/job/hilton-istanbul-bomonti-hotel-conference-center/cost-controller

Unlike merchandising firms, manufacturing firms must calculate their cost of goods sold based on how much they manufacture and how much it costs them to manufacture those goods. This requires manufacturing firms to prepare an additional statement before they can prepare their income statement. This additional statement is the *Cost of Goods Manufactured* statement. Once the cost of goods manufactured is calculated, the cost is then incorporated into the manufacturing firm's income statement to calculate its cost of goods sold.

One thing manufacturing firms must consider in their cost of goods manufactured is that, at any given time, they have products at varying levels of production: some are finished and others are still process. The cost of goods manufactured statement measures the cost of the goods actually finished during the period, whether or not they were started during that period.

Before examining the typical manufacturing firm's process to track cost of goods manufactured, you need basic definitions of three terms in the schedule of Costs of Goods Manufactured: direct materials, direct labor, and manufacturing overhead. **Direct materials** are the components used in the production process whose costs can be identified on a per item-produced basis. For example, if you are producing cars, the engine would be a direct material item. The direct material cost would be the cost of one engine. **Direct labor** represents production labor costs that can be identified on a per item-produced basis. Referring to the car production example, assume that the engines are placed in the car by individuals rather than by an automated process. The direct labor cost would be the amount of labor in hours multiplied by the hourly labor cost. **Manufacturing overhead** generally includes those costs incurred in the production process that are not economically feasible to measure as direct material or direct labor costs. Examples include the department manager's salary, the production factory's utilities, or glue used to attach rubber molding in the auto production process. Since there are so many possible costs that can be classified as manufacturing overhead, they tend to be grouped and then allocated in a predetermined manner to the production process.

Figure 2.8 is an example of the calculation of the Cost of Goods Manufactured for Koeller Manufacturing. It demonstrates the relationship between cost of goods manufactured and cost of goods in progress and includes the three main types of manufacturing costs.

KOELLER MANUFACTURING
Schedule of Cost of Goods Manufactured
For the Month Ended March 31, 2017

Work in Process Inventory (beginning balance)		$ 75,000
Current Manufacturing Costs:		
Direct Material	$15,000	
Direct Labor	25,000	
Manufacturing Overhead	23,000	
Total Manufacturing Costs		63,000
Total Cost of Work in Process		138,000
– Work in Process, ending balance		43,000
Cost of Goods Manufactured		$ 95,000

Figure 2.8 Koeller Manufacturing's Cost of Goods Manufactured. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

As you can see, the manufacturing firm takes into account its work-in-process (WIP) inventory as well as the costs incurred during the current period to finish not only the units that were in the beginning WIP inventory, but also a portion of any production that was started but not finished during the month. Notice that the current manufacturing costs, or the additional costs incurred during the month, include direct materials, direct

labor, and manufacturing overhead. Direct materials are calculated as

Materials Inventory (beginning balance)
+ Net Material Purchases
= Materials Available for Use
− Materials Inventory (ending balance)
= Direct Materials Used in Production

All of these costs are carefully tracked and classified because the cost of manufacturing is a vital component of the schedule of cost of goods sold. To continue with the example, Koeller Manufacturing calculated that the cost of goods sold was $95,000, which is carried through to the Schedule of Cost of Goods Sold (Figure 2.9).

KOELLER MANUFACTURING Schedule of Cost of Goods Sold For the Month Ended March 31, 2017	
Beginning Finished Goods Inventory	$ 65,000
+ Cost of Goods Manufactured	95,000
Goods Available for Sale	160,000
– Ending Finished Goods Inventory	58,000
Cost of Goods Sold	$102,000

Figure 2.9 Koeller Manufacturing's Cost of Goods Sold. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Now when Koeller Manufacturing prepares its income statement, the simplified statement will appear as shown in Figure 2.10.

KOELLER MANUFACTURING Income Statement For the Month Ended March 31, 2017	
Sales	$214,000
– Cost of Goods Sold	102,000
Gross Profit	112,000
– Operating Expenses	80,000
Operating Income	$ 32,000

Figure 2.10 Koeller Manufacturing's Income Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

So, even though the income statements for the merchandising firm and the manufacturing firm appear very similar at first glance, there are many more costs to be captured by the manufacturing firm. Figure 2.11 compares and contrasts the methods merchandising and manufacturing firms use to calculate the cost of goods sold in their income statement.

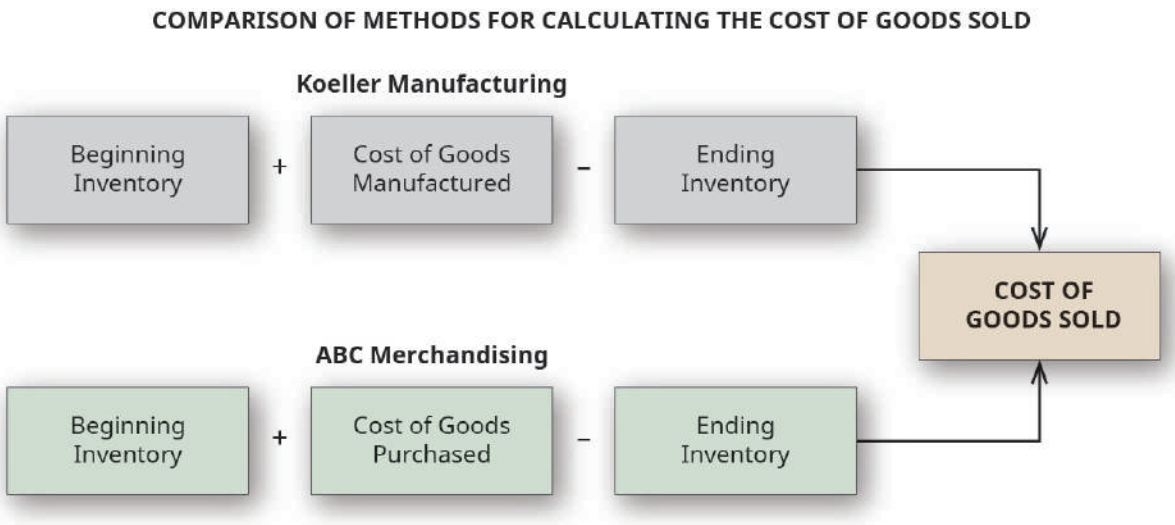


Figure 2.11 Merchandising firms consider the cost of goods purchased, and manufacturing firms consider the cost of goods manufactured in order to determine the cost of goods sold. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

CONCEPTS IN PRACTICE

Calculating Cost of Goods Sold in Manufacturing

Just Desserts is a bakery that produces and sells cakes and pies to grocery stores for resale. Although they are a small manufacturer, they incur many of the costs of a much larger organization. In 2017, they reported these revenue and expenses:

Office rent	$20,000	Sales revenue	$150,000
Office utilities	1,500	Cost of goods sold	70,000
Administrative salaries	35,000	Administrative expenses	12,000

Their income statement is shown in Figure 2.12.

JUST DESSERTS
Income Statement
For the Year Ended December 31, 2017

Sales Revenue		$150,000
Cost of Goods Sold		70,000
Gross Profit		80,000
Administrative Expenses	$12,000	
Administrative Salaries	35,000	
Office Utilities	1,500	
Office Rent	20,000	
Operating Expenses		68,500
Net Income		$ 11,500

Figure 2.12 Just Desserts' Income Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

You'll learn more about the flow of manufacturing costs in Identify and Apply Basic Cost Behavior Patterns. For now, recognize that, unlike a merchandising firm, calculating cost of goods sold in manufacturing firms can be a complex task for management.

Service Organizations

A **service organization** is a business that earns revenue by providing **intangible products**, those that have no physical substance. The service industry is a vital sector of the U.S. economy, providing 65% of the U.S. private-sector gross domestic product and more than 79% of U.S. private-sector jobs.[3] If **tangible products**, physical goods that customers can handle and see, are provided by a service organization, they are considered ancillary sources of revenue. Large service organizations such as airlines, insurance companies, and hospitals incur a variety of costs in the provision of their services. Costs such as labor, supplies, equipment, advertising, and facility maintenance can quickly spiral out of control if management is not careful. Therefore, although their cost drivers are sometimes not as complex as those of other types of firms, cost identification and control are every bit as important in the service industry.

For example, consider the services that a law firm provides its clients. What clients pay for are services such as representation in legal proceedings, contract negotiations, and preparation of wills. Although the true value of these services is not contained in their physical form, they are of value to the client and the source of revenue to the firm. The managing partners in the firm must be as cost conscious as their counterparts in merchandising and manufacturing firms. Accounting for costs in service firms differs from merchandising and manufacturing firms in that they do not purchase or produce goods. For example, consider a medical practice. Although some services provided are tangible products, such as medications or medical devices, the primary benefits the physicians provide their patients are the intangible services that are comprised of his or her knowledge, experience, and expertise.

3 John Ward. "The Services Sector: How Best to Measure It?" International Trade Administration. Oct. 2010. https://2016.trade.gov/publications/ita-newsletter/1010/services-sector-how-best-to-measure-it.asp. "United States GDP from Private Services Producing Industries." Trading Economics / U.S. Bureau of Economic Analysis. July 2018. https://tradingeconomics.com/united-states/gdp-from-services. "Employment in Services (% of Total Employment) (Modeled ILO Estimate)." International Labour Organization, ILOSTAT database. The World Bank. Sept. 2018. https://data.worldbank.org/indicator/SL.SRV.EMPL.ZS.

Service providers have some costs (or revenue) derived from tangible goods that must be taken into account when pricing their services, but their largest cost categories are more likely to be administrative and personnel costs rather than product costs.

Service Revenue
– Operating Expenses
= Operating Profit

For example, Whichard & Klein, LLP, is a full-service accounting firm with their primary offices in Baltimore, Maryland. With two senior partners and a small staff of accountants and payroll specialists, the majority of the costs they incur are related to personnel. The value of the accounting and payroll services they provide to their clients is intangible in comparison to goods sold by a merchandiser or produced by a manufacturer but has value and is the primary source of revenue for the firm. At the end of 2019, Whichard and Klein reported the following revenue and expenses:

Revenue from services provided	$412,000	Utilities	$11,000
Accounting personnel salaries	210,000	Miscellaneous expenses	7,500
Office expense	35,000	Administrative salaries	45,000
Office equipment	9,000		

Their Income Statement for the period is shown in Figure 2.13.

WHICHARD & KLEIN, LLP
Income Statement
For the Year Ended December 31, 2019

Service Revenue	$412,000
Operating Expenses	
Salaries	210,000
Office Expense	35,000
Office Equipment	9,000
Administrative Salaries	45,000
Utilities	11,000
Miscellaneous	7,500
Total Operating Expenses	317,500
Operating Income	$ 94,500

Figure 2.13 Whichard & Klein's Income Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

The bulk of the expenses incurred by Whichard & Klein are in personnel and administrative/office costs, which are very common among businesses that have services as their primary source of revenue.

CONCEPTS IN PRACTICE

Revenue and Expenses for a Law Office

The revenue and expenses for a law firm illustrate how the income statement for a service firm differs from that of a merchandising or manufacturing firm.

Welch & Graham is a well-established law firm that provides legal services in the areas of criminal law, real estate transactions, and personal injury. The firm employs several attorneys, paralegals, and office support staff. In 2017, they reported the following revenue and expenses:

Office rent	$ 20,000	Paralegal salaries	$ 100,000
Office utilities	12,500	Service revenue	1,500,000
Administrative salaries	150,000	Office expenses	12,000
Attorneys' salaries	750,000		

Their income statement is shown in Figure 2.14.

WELCH & GRAHAM, ATTORNEYS AT LAW
Income Statement
For the Year Ended December 31, 2017

Service Revenue		$1,500,000
Operating Expenses		
Administrative Salaries	$ 150,000	
Attorney Salaries	750,000	
Office Expenses	12,000	
Office Rent	20,000	
Paralegal Salaries	100,000	
Office Utilities Expenses	12,500	
Total Operating Expenses		1,044,500
Net Income		$ 455,500

Figure 2.14 Welch & Graham's Income Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

As you can see, the majority of the costs incurred by the law firm are personnel related. They may also incur costs from equipment and materials such computer networks, phone and switchboard equipment, rent, insurance, and law library materials necessary to support the practice, but these costs represent a much smaller percentage of total cost than the administrative and personnel costs.

THINK IT THROUGH

Expanding a Business

Margo is the owner of a small retail business that sells gifts and home decorating accessories. Her business is well established, and she is now considering taking over additional retail space to expand her business to include gourmet foods and gift baskets. Based on customer feedback, she is confident that there is a demand for these items, but she is unsure how large that demand really is. Expanding her business this way will require that she incur not only new costs but also increases in existing costs.

Margo has asked for your help in identifying the impact of her decision to expand in terms of her costs. When discussing these cost increases, be sure to specifically identify those costs that are directly tied to

her products and that would be considered overhead expenses.

2.2 Identify and Apply Basic Cost Behavior Patterns

Now that we have identified the three key types of businesses, let's identify cost behaviors and apply them to the business environment. In managerial accounting, different companies use the term *cost* in different ways depending on how they will use the cost information. Different decisions require different costs classified in different ways. For instance, a manager may need cost information to plan for the coming year or to make decisions about expanding or discontinuing a product or service. In practice, the classification of costs changes as the use of the cost data changes. In fact, a single cost, such as rent, may be classified by one company as a fixed cost, by another company as a committed cost, and by even another company as a period cost. Understanding different cost classifications and how certain costs can be used in different ways is critical to managerial accounting.

ETHICAL CONSIDERATIONS

Institute of Management Accountants and Certified Management Accountant Certification

Managerial accountants provide businesses with clear and direct insight into the monetary effects of any particular operational action under consideration. They are expected to report financial information in a transparent and ethical fashion. The Institute of Management Accountants (IMA) offers the Certified Management Accountant (CMA) certification. IMA members and CMAs agree to uphold a set of ethical principles that includes honesty, fairness, objectivity, and responsibility. Any managerial accountant, even if not an IMA member or certified CMA, should act in accordance with these principles and encourage coworkers to follow ethical principles for reporting financial results and monetary effects of financial decisions related to their organization. The IMA Committee on Ethics encourages organizations and individuals to adopt, promote, and execute business practices consistent with high ethical standards.[4]

Major Cost Behavior Patterns

Any discussion of costs begins with the understanding that most costs will be classified in one of three ways: fixed costs, variable costs, or mixed costs. The costs that don't fall into one of these three categories are hybrid costs, which are examined only briefly because they are addressed in more advanced accounting courses. Because fixed and variable costs are the foundation of all other cost classifications, understanding whether a cost is a fixed cost or a variable cost is very important.

Fixed versus Variable Costs

A **fixed cost** is an unavoidable operating expense that does not change in total over the short term, even if a

4 "Ethics Center." Institute of Management Accountants. https://www.imanet.org/career-resources/ethics-center?ssopc=1

business experiences variation in its level of activity. Table 2.2 illustrates the types of fixed costs for merchandising, service, and manufacturing organizations.

Examples of Fixed Costs

Type of Business	Fixed Cost
Merchandising	Rent, insurance, managers' salaries
Manufacturing	Property taxes, insurance, equipment leases
Service	Rent, straight-line depreciation, administrative salaries, and insurance

Table 2.2

We have established that fixed costs do not change in total as the level of activity changes, but what about fixed costs on a *per-unit* basis? Let's examine Tony's screen-printing company to illustrate how costs can remain fixed in total but change on a per-unit basis.

Tony operates a screen-printing company, specializing in custom T-shirts. One of his fixed costs is his monthly rent of $1,000. Regardless of whether he produces and sells any T-shirts, he is obligated under his lease to pay $1,000 per month. However, he can consider this fixed cost on a per-unit basis, as shown in Figure 2.15.

Monthly Rent	Number of T-Shirts Manufactured	Average Rent Cost per T-Shirt
$1,000	200	$5.00
1,000	400	2.50
1,000	600	1.67

Figure 2.15 Individual Rent Cost per T-Shirt Produced. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Tony's information illustrates that, despite the unchanging fixed cost of rent, as the level of activity increases, the per-unit fixed cost falls. In other words, fixed costs remain fixed in total but can increase or decrease on a per-unit basis.

Two specialized types of fixed costs are committed fixed costs and discretionary fixed costs. These classifications are generally used for long-range planning purposes and are covered in upper-level managerial accounting courses, so they are only briefly described here.

Committed fixed costs are fixed costs that typically cannot be eliminated if the company is going to continue to function. An example would be the lease of factory equipment for a production company.

Discretionary fixed costs generally are fixed costs that can be incurred during some periods and postponed during other periods but which cannot normally be eliminated permanently. Examples could include advertising campaigns and employee training. Both of these costs could potentially be postponed temporarily, but the company would probably incur negative effects if the costs were permanently eliminated. These classifications are generally used for long-range planning purposes.

In addition to understanding fixed costs, it is critical to understand variable costs, the second fundamental cost classification. A **variable cost** is one that varies in direct proportion to the level of activity within the business. Typical costs that are classified as variable costs are the cost of raw materials used to produce a product, labor applied directly to the production of the product, and overhead expenses that change based upon activity. For each variable cost, there is some activity that drives the variable cost up or down. A **cost driver** is defined as any activity that causes the organization to incur a variable cost. Examples of cost drivers are direct labor hours, machine hours, units produced, and units sold. Table 2.3 provides examples of variable costs and their associated cost drivers.

Variable Costs and Associated Cost Drivers

	Variable Cost	Cost Driver
Merchandising	Total monthly hourly wages for sales staff	Hours business is open during month
Manufacturing	Direct materials used to produce one unit of product	Number of units produced
Service	Cost of laundering linens and towels	Number of hotel rooms occupied

Table 2.3

Unlike fixed costs that remain fixed in total but change on a per-unit basis, variable costs remain the same per unit, but change in total relative to the level of activity in the business. Revisiting Tony's T-Shirts, Figure 2.16 shows how the variable cost of ink behaves as the level of activity changes.

Cost of Ink per T-Shirt	Number of T-Shirts Produced	Total Variable Cost of Ink
$0.15	2,000	$300
0.15	4,000	600
0.15	6,000	900

Figure 2.16 Variable Costs per Unit. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

As Figure 2.16 shows, the variable cost per unit (per T-shirt) does not change as the number of T-shirts produced increases or decreases. However, the variable costs change in total as the number of units produced increases or decreases. In short, total variable costs rise and fall as the level of activity (the cost driver) rises and falls.

Distinguishing between fixed and variable costs is critical because the **total cost** is the sum of all fixed costs (the **total fixed costs**) and all variable costs (the **total variable costs**). For every unit produced, every customer served, or every hotel room rented, for example, managers can determine their total costs both per unit of activity and in total by combining their fixed and variable costs together. The graphic in Figure 2.17 illustrates the concept of total costs.

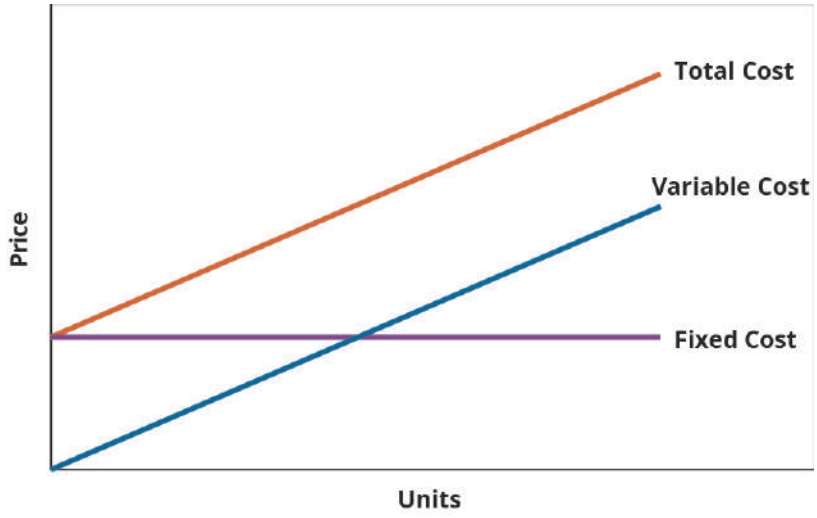


Figure 2.17 Total Cost as the Sum of Total Fixed Costs and Total Variable Costs. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Remember that the reason that organizations take the time and effort to classify costs as either fixed or variable is to be able to control costs. When they classify costs properly, managers can use cost data to make decisions and plan for the future of the business.

CONCEPTS IN PRACTICE

Boeing[5]

If you've ever flown on an airplane, there's a good chance you know Boeing. The Boeing Company generates around $90 billion each year from selling thousands of airplanes to commercial and military customers around the world. It employs around 200,000 people, and it's indirectly responsible for more than a million jobs through its suppliers, contractors, regulators, and others. Its main assembly line in Everett, WA, is housed in the largest building in the world, a colossal facility that covers nearly a half-trillion cubic feet. Boeing is, simply put, a massive enterprise.

And yet, Boeing's managers know the exact cost of everything the company uses to produce its airplanes: every propeller, flap, seat belt, welder, computer programmer, and so forth. Moreover, they know how those costs would change if they produced more airplanes or fewer. They also know the price at which they sold each plane and the profit the company made on each sale. Boeing's executives expect their managers to know this information, in real time, if the company is to remain profitable.

5 Attribution: Modification of work by Sharon Kioko and Justin Marlowe. "Cost Analysis." *Financial Strategy for Public Managers*. CC BY 4.0. https://press.rebus.community/financialstrategy/chapter/cost-analysis/

Link between Business Decision and Cost Information Utilized

Decision	Cost Information
Discontinue a product line	Variable costs, overhead directly tied to product, potential reduction in fixed costs
Add second production shift	Labor costs, cost of fringe benefits, potential overhead increases (utilities, security personnel)
Open additional retail outlets	Fixed costs, variable operating costs, potential increases in administrative expenses at corporate headquarters

Table 2.4

Average Fixed Costs versus Average Variable Costs

Another way management may want to consider their costs is as average costs. Under this approach, managers can calculate both average fixed and average variable costs. **Average fixed cost (AFC)** is the total fixed costs divided by the total number of units produced, which results in a per-unit cost. The formula is:

$$\text{Average Fixed Cost (AFC)} = \frac{\text{Total Fixed Costs}}{\text{Total Number of Units Produced}}$$

To show how a company would use AFC to make business decisions, consider Carolina Yachts, a company that manufactures sportfishing boats that are sold to consumers through a network of marinas and boat dealerships. Carolina Yachts produces 625 boats per year, and their total annual fixed costs are $1,560,000. If they want to determine an average fixed cost per unit, they will find it using the formula for AFC:

$$\text{AFC} = \frac{\$1{,}560{,}000}{625} = \$2{,}496 \text{ per boat}$$

When they produce 625 boats, Carolina Yachts has an AFC of $2,496 per boat. What happens to the AFC if they increase or decrease the number of boats produced? Figure 2.18 shows the AFC for different numbers of boats.

Number of Boats Produced	Total Fixed Costs	Average Fixed Cost (per boat)
500	$1,560,000	$3,120
625	1,560,000	2,496
700	1,560,000	2,229

Figure 2.18 Average Fixed Costs for Carolina Yachts. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

We see that total fixed costs remain unchanged, but the average fixed cost per unit goes up and down with the number of boats produced. As more units are produced, the fixed costs are spread out over more units, making the fixed cost per unit fall. Likewise, as fewer boats are manufactured, the average fixed costs per unit rises. We can use a similar approach with variable costs.

Average variable cost (AVC) is the total variable costs divided by the total number of units produced, which results in a per-unit cost. Like ATC, we can use this formula:

$$\text{Average Variable Cost (AVC)} = \frac{\text{Total Variable Costs}}{\text{Total Number of Units Produced}}$$

To demonstrate AVC, let's return to Carolina Yachts, which incurs total variable costs of $6,875,000 when they produce 625 boats per year. They can express this as an average variable cost per unit:

$$\text{AVC} = \frac{\$6{,}875{,}000}{625} = \$11{,}000 \text{ per boat}$$

Because average variable costs are the average of all costs that change with production levels on a per-unit basis and include both direct materials and direct labor, managers often use AVC to determine if production should continue or not in the short run. As long as the price Carolina Yachts receives for their boats is greater than the per-unit AVC, they know that they are not only covering the variable cost of production, but each boat is making a contribution toward covering fixed costs. If, at any point, the average variable cost per boat rises to the point that the price no longer covers the AVC, Carolina Yachts may consider halting production until the variable costs fall again.

These changes in variable costs per unit could be caused by circumstances beyond their control, such as a shortage of raw materials or an increase in shipping costs due to high gas prices. In any case, average variable cost can be useful for managers to get a big picture look at their variable costs per unit.

LINK TO LEARNING

Watch the video from Khan Academy that uses the scenario of computer programming to teach fixed, variable, and marginal cost (https://openstax.org/l/50costing) to learn more.

Mixed Costs and Stepped Costs

Not all costs can be classified as purely fixed or purely variable. **Mixed costs** are those that have both a fixed and variable component. It is important, however, to be able to separate mixed costs into their fixed and variable components because, typically, in the short run, we can only change variable costs but not most fixed costs. To examine how these mixed costs actually work, consider the Ocean Breeze hotel.

The Ocean Breeze is located in a resort area where the county assesses an occupancy tax that has both a fixed and a variable component. Ocean Breeze pays $2,000 per month, regardless of the number of rooms rented. Even if it does not rent a single room during the month, Ocean Breeze still must remit this tax to the county. The hotel treats this $2,000 as a fixed cost. However, for every night that a room is rented, Ocean Breeze must remit an additional tax amount of $5.00 per room per night. As a result, the occupancy tax is a mixed cost. Figure 2.19 further illustrates how this mixed cost behaves.

Number of Rooms Rented per Month (Cost Driver)	Fixed Cost Component ($2,000 per month)	Variable Cost Component ($5 per room)	Total Cost (Fixed + Variable)
0	$2,000	$ 0	$2,000
60	2,000	300	2,300
85	2,000	425	2,425
100	2,000	500	2,500

Figure 2.19 Mixed Costs Example for Ocean Breeze. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Notice that Ocean Breeze cannot control the fixed portion of this cost and that it remains fixed in total, regardless of the activity level. On the other hand, the variable component is fixed per unit, but changes in total based upon the level of activity. The fixed portion of this cost plus the variable portion of this cost combine to make the total cost. As a result, the formula for total cost looks like this:

$$Y = a + bx$$

where Y is the total mixed cost, a is the fixed cost, b is the variable cost per unit, and x is the level of activity.

Graphically, mixed costs can be explained as shown in Figure 2.20.

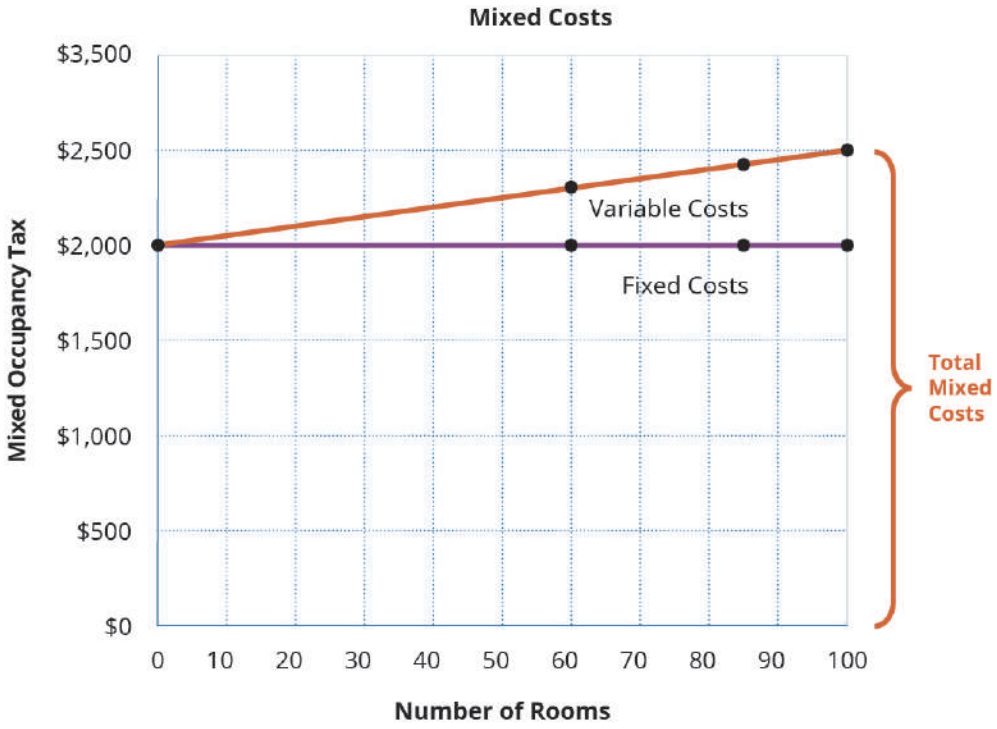


Figure 2.20 Ocean Breeze's Mixed Cost Graph. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

The graph shows that mixed costs are typically both fixed and linear in nature. In other words, they will often have an initial cost, in Ocean Breeze's case, the $2,000 fixed component of the occupancy tax, and a variable component, the $5 per night occupancy tax. Note that the Ocean Breeze mixed cost graph starts at an initial

$2,000 for the fixed component and then increases by $5 for each night their rooms are occupied.

Some costs behave less linearly. A cost that changes with the level of activity but is not linear is classified as a **stepped cost**. Step costs remain constant at a fixed amount over a range of activity. The range over which these costs remain unchanged (fixed) is referred to as the **relevant range**, which is defined as a specific activity level that is bounded by a minimum and maximum amount. Within this relevant range, managers can predict revenue or cost levels. Then, at certain points, the step costs increase to a higher amount. Both fixed and variable costs can take on this stair-step behavior. For instance, wages often act as a stepped variable cost when employees are paid a flat salary and a commission or when the company pays overtime. Further, when additional machinery or equipment is placed into service, businesses will see their fixed costs stepped up. The "trigger" for a cost to step up is the relevant range. Graphically, step costs appear like stair steps (Figure 2.21).

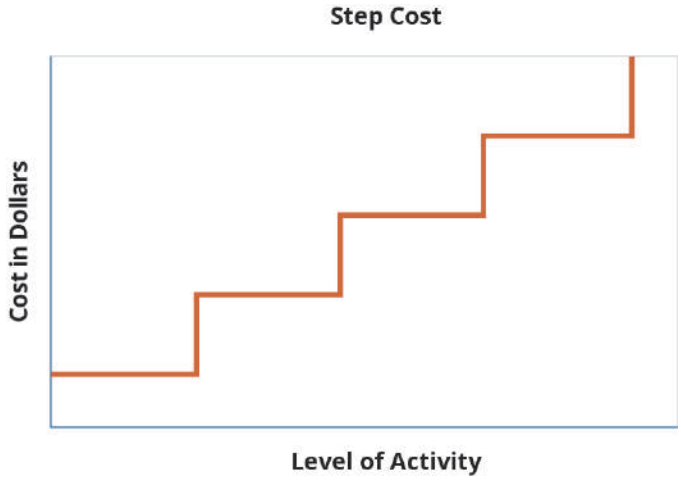


Figure 2.21 Step Cost Graph. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

For example, suppose a quality inspector can inspect a maximum of 80 units in a regular 8-hour shift and his salary is a fixed cost. Then the relevant range for QA inspection is from 0–80 units per shift. If demand for these units increases and more than 80 inspections are needed per shift, the relevant range has been exceeded and the business will have one of two choices:

(1) Pay the quality inspector overtime in order to have the additional units inspected. This overtime will "step up" the variable cost per unit. The advantage to handling the increased cost in this way is that when demand falls, the cost can quickly be "stepped down" again. Because these types of step costs can be adjusted quickly and often, they are often still treated as variable costs for planning purposes.

(2) "Step up" fixed costs. If the company hires a second quality inspector, they would be stepping up their fixed costs. In effect, they will double the relevant range to allow for a maximum of 160 inspections per shift, assuming the second QA inspector can inspect an additional 80 units per shift. The down side to this approach is that once the new QA inspector is hired, if demand falls again, the company will be incurring fixed costs that are unnecessary. For this reason, adding salaried personnel to address a short-term increase in demand is not a decision most businesses make.

Step costs are best explained in the context of a business experiencing increases in activity beyond the relevant range. As an example, let's return to Tony's T-Shirts.

Tony's cost of operations and the associated relevant ranges are shown in Table 2.5.

Tony's T-Shirts Cost Options

	Cost	Type of Cost	Relevant Range
Lease on Screen-Printing Machine	$2,000 per month	Fixed	0–2,000 T-shirts per month
Employee	$10 per hour	Variable	20 shirts per hour
Tony's Salary	$2,500 per month	Fixed	N/A
Screen-Printing Ink	$0.25 per shirt	Variable	N/A
Building Rent	$1,500 per month	Fixed	2 screen-printing machines and 2 employees

Table 2.5

As you can see, Tony has both fixed and variable costs associated with his business. His one screen-printing machine can only produce 2,000 T-shirts per month and his current employee can produce 20 shirts per hour (160 per 8-hour work day). The space that Tony leases is large enough that he could add an additional screen-printing machine and 1 additional employee. If he expands beyond that, he will need to lease a larger space, and presumably his rent would increase at that point. It is easy for Tony to predict his costs as long as he operates within the relevant ranges by applying the total cost equation $Y = a + bx$. So, for Tony, as long as he produces 2,000 or fewer T-shirts, his total cost will be found by $Y = \$6{,}000 + \$0.75x$, where the variable cost of $0.75 is the $0.25 cost of the ink per shirt and $0.50 per shirt for labor ($10 per hour wage/20 shirts per hour). As soon as his production passes the 2,000 T-shirts that his one employee and one machine can handle, he will have to add a second employee and lease a second screen-printing machine. In other words, his fixed costs will rise from $6,000 to $8,000, and his variable cost per T-shirt will rise from $0.75 to $1.25 (ink plus 2 workers). Thus, his new cost equation is $Y = \$8{,}000 + \$1.25x$ until he "steps up" again and adds a third machine *and* moves to a new location with a presumably higher rent. Let's take a look at this in chart form to better illustrate the "step" in cost Tony will experience as he steps past 2,000 T-shirts.

Tony's cost information is shown in the chart for volume between 500 and 4,000 shirts.

Number of T-Shirts	Total Cost (rounded)
500	$ 6,375
750	6,563
1,000	6,750
1,250	6,938
1,500	7,125
1,750	7,313
2,000	7,500
2,250	10,813
2,500	11,125
2,750	11,438
3,000	11,750
3,250	12,063
3,500	12,375
3,750	12,688

When presented graphically, notice what happens when Tony steps outside of his original relevant range and has to add a second employee and a second screen-printing machine:

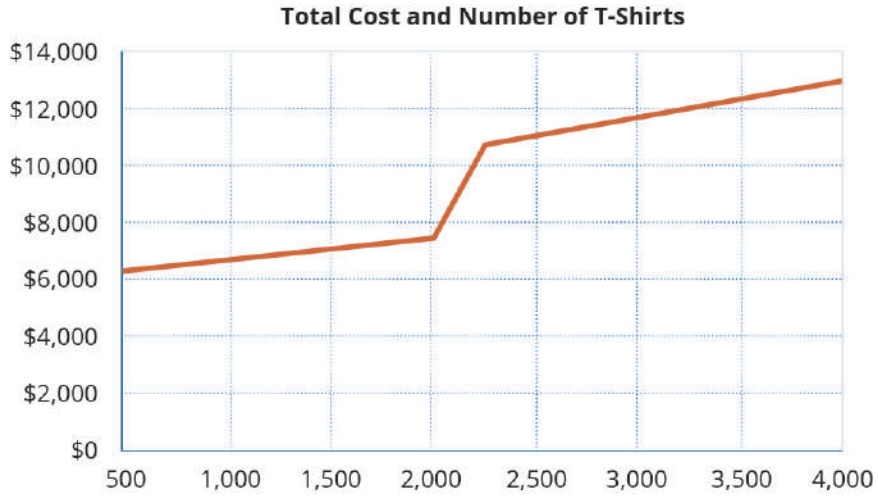


Figure 2.22 Stepped Variable Costs for Tony's T-Shirts. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

It is important to remember that even though Tony's costs stepped up when he exceeded his original capacity (relevant range), the *behavior* of the costs did not change. His fixed costs still remained fixed in total and his total variable cost rose as the number of T-shirts he produced rose. Table 2.6 summarizes how costs behave within their relevant ranges.

Summary of Fixed and Variable Cost Behaviors

Cost	In Total	Per Unit
Variable Cost	Changes in response to the level of activity	Remains fixed per unit regardless of the level of activity
Fixed Cost	Does not change with the level of activity, within the relevant range, but does change when the relevant range changes	Changes based upon activity within the relevant range: increased activity decreases per-unit cost; decreased activity increases per-unit cost

Table 2.6

Product versus Period Costs

Many businesses can make decisions by dividing their costs into fixed and variable costs, but there are some business decisions that require grouping costs differently. Sometimes companies need to consider how those costs are reported in the financial statements. At other times, companies group costs based on functions within the business. For example, a business would group administrative and selling expenses by the period (monthly or quarterly) so that they can be reported on an Income Statement. However, a manufacturing firm may carry product costs such as materials from one period to the other in order to have the costs "travel" with the units being produced. It is possible that both the selling and administrative costs and materials costs have both fixed and variable components. As a result, it may be necessary to analyze some fixed costs together with some variable costs. Ultimately, businesses strategically group costs in order to make them more useful for decision-making and planning. Two of the broadest and most common grouping of costs are product costs and period costs.

Product costs are all those associated with the acquisition or production of goods and products. When products are purchased for resale, the cost of goods is recorded as an asset on the company's balance sheet. It is not until the products are sold that they become an expense on the income statement. By moving product costs to the expense account for the cost of goods sold, they are easily matched to the sales revenue income account. For example, Bert's Bikes is a bicycle retailer who purchases bikes from several wholesale distributors and manufacturers. When Bert purchases bicycles for resale, he places the cost of the bikes into his inventory account, because that is what those bikes are—his inventory available for sale. It is not until someone purchases a bike that it creates sales revenue, and in order to fulfill the requirements of double-entry accounting, he must match that income with an expense: the cost of goods sold (Figure 2.23).

JOURNAL			
Date	**Account**	**Debit**	**Credit**
	Cost of Goods Sold	25,000	
	Finished Goods Inventory		25,000
	To record the cost of products sold		

Figure 2.23 Journal Entry for Cost of Goods Sold. Product costs are collected in the finished goods inventory, where they remain until the goods are sold. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Some product costs have both a fixed and variable component. For example, Bert purchases 10 bikes for $100 each. The distributor charges $10 per bike for shipping for 1 to 10 bikes but $8 per bike for 11 to 20 bikes. This shipping cost is fixed per unit but varies in total. If Bert wants to save money and control his cost of goods sold, he can order an 11th bike and drop his shipping cost by $2 per bike. It is important for Bert to know what is fixed and what is variable so that he can control his costs as much as possible.

What about the costs Bert incurs that are not product costs? **Period costs** are simply all of the expenses that are not product costs, such as all selling and administrative expenses. It is important to remember that period costs are treated as expenses in the period in which they occur. In other words, they follow the rules of accrual accounting practice by recognizing the cost (expense) in the period in which they occur regardless of when the cash changes hands. For example, Bert pays his business insurance in January of each year. Bert's annual insurance premium is $10,800, which is $900 per month. Each month, Bert will recognize 1/12 of this insurance cost as an expense in the period in which it is incurred (Figure 2.24).

JOURNAL			
Date	**Account**	**Debit**	**Credit**
	Insurance Expense	900	
	Prepaid Insurance		900
	To recognize current period insurance expense		

Figure 2.24 Journal Entry for Insurance Expense. Bert applies 1/12 of the prepaid insurance premium per month to the expense account in order to match period costs with period revenues. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Why is it so important for Bert to know which costs are product costs and which are period costs? Bert may have little control over his product costs, but he maintains a great deal of control over many of his period costs. For this reason, it is important that Bert be able to identify his period costs and then determine which of them are fixed and which are variable. Remember that fixed costs are fixed over the relevant range, but variable costs change with the level of activity. If Bert wants to control his costs to make his bike business more profitable, he must be able to differentiate between the costs he can and cannot control.

Just like a merchandising business such as Bert's Bikes, manufacturers also classify their costs as either product costs or period costs. For a manufacturing business, product costs are the costs associated with making the product, and period costs are all other costs. For the purposes of external reporting, separating costs into period and product costs is not all that is necessary. However, for management decision-making activities, refinement of the types of product costs is helpful.

In a manufacturing firm, the need for management to be aware of the types of costs that make up the cost of a product is of paramount importance. Let's look at Carolina Yachts again and examine how they can classify the product costs associated with building their sportfishing boats. Just like automobiles, every year, Carolina Yachts makes changes to their boats, introducing new models to their product line. When the engineers begin to redesign boats for the next year, they must be careful not to make changes that would drive the selling price of their boats too high, making them less attractive to the customer. The engineers need to know exactly what the addition of another feature will do to the cost of production. It is not enough for them to get total product cost data; instead, they need specific information about the three classes of product costs: materials, labor, and overhead.

As you've learned, direct materials are the raw materials and component parts that are directly economically

traceable to a unit of production.

Table 2.7 provides some examples of direct materials.

Examples of Direct Materials

Manufacturing Business	Product	Direct Materials
Bakery	Birthday cakes	Flour, sugar, eggs, milk
Automobile manufacturer	Cars	Glass, steel, tires, carpet
Furniture manufacturer	Recliners	Wood, fabric, cotton batting

Table 2.7

In each of the examples, managers are able to trace the cost of the materials directly to a specific unit (cake, car, or chair) produced. Since the amount of direct materials required will change based on the number of units produced, direct materials are almost always classified as a variable cost. They remain fixed per unit of production but change in total based on the level of activity within the business.

It takes more than materials for Carolina Yachts to build a boat. It requires the application of labor to the raw materials and component parts. You've also learned that direct labor is the work of the employees who are directly involved in the production of goods or services. In fact, for many industries, the largest cost incurred in the production process is labor. For Carolina Yachts, their direct labor would include the wages paid to the carpenters, painters, electricians, and welders who build the boats. Like direct materials, direct labor is typically treated as a variable cost because it varies with the level of activity. However, there are some companies that pay a flat weekly or monthly salary for production workers, and for these employees, their compensation could be classified as a fixed cost. For example, many auto mechanics are now paid a flat weekly or monthly salary.

While in the example Carolina Yachts is dependent upon direct labor, the production process for companies in many industries is moving from human labor to a more automated production process. For these companies, direct labor in these industries is becoming less significant. For an example, you can research the current production process for the automobile industry.

The third major classification of product costs for a manufacturing business is overhead. Manufacturing overhead (sometimes referred to as *factory overhead*) includes all of the costs that a manufacturing business incurs, other than the variable costs of direct materials and direct labor required to build products. These overhead costs are not directly attributable to a specific unit of production, but they are incurred to support the production of goods. Some of the items included in manufacturing overhead include supervisor salaries, depreciation on the factory, maintenance, insurance, and utilities. It is important to note that manufacturing overhead does not include any of the selling or administrative functions of a business. For Carolina Yachts, costs like the sales, marketing, CEO, and clerical staff salaries will not be included in the calculation of manufacturing overhead costs but will instead be allocated to selling and administrative expenses.

As you have learned, much of the power of managerial accounting is its ability to break costs down into the smallest possible trackable unit. This also applies to manufacturing overhead. In many cases, businesses have a need to further refine their overhead costs and will track indirect labor and indirect materials.

When labor costs are incurred but are not directly involved in the active conversion of materials into finished

products, they are classified as **indirect labor** costs. For example, Carolina Yachts has production supervisors who oversee the manufacturing process but do not actively participate in the construction of the boats. Their wages generally support the production process but cannot be traced back to a single unit. For this reason, the production supervisors' salary would be classified as indirect labor. Similar to direct labor, on a product or department basis, indirect labor, such as the supervisor's salary, is often treated as a fixed cost, assuming that it does not vary with the level of activity or number of units produced. However, if you are considering the supervisor's salary cost on a per unit of production basis, then it could be considered a variable cost.

Similarly, not all materials used in the production process can be traced back to a specific unit of production. When this is the case, they are classified as **indirect material** costs. Although needed to produce the product, these indirect material costs are not traceable to a *specific* unit of production. For Carolina Yachts, their indirect materials include supplies like tools, glue, wax, and cleaning supplies. These materials are required to build a boat, but management cannot easily track how much of a bottle of glue they use or how often they use a particular drill to build a specific boat. These indirect materials and their associated cost represent a small fraction of the total materials needed to complete a unit of production. Like direct materials, indirect materials are classified as a variable cost since they vary with the level of production. Table 2.8 provides some examples of manufacturing costs and their classifications.

Examples of Classifications of Manufacturing Costs

Cost	Classification	Fixed or Variable
Production supervisor salary	Indirect labor	Fixed
Raw materials used in production	Direct materials	Variable
Wages of production employees	Direct labor	Variable
Straight-line depreciation on factory equipment	General manufacturing overhead	Fixed
Glue and adhesives	Indirect materials	Variable

Table 2.8

Prime Costs versus Conversion Costs

In certain production environments, once a business has separated the costs of the product into direct materials, direct labor, and overhead, the costs can then be gathered into two broader categories: prime costs and conversion costs. **Prime costs** are the direct material expenses and direct labor costs, while **conversion costs** are direct labor and general factory overhead combined. Please note that these two categories of costs are examples of cost categories where a particular cost can be included in both. In this case, direct labor is included in both prime costs and conversion costs.

These cost classifications are common in businesses that produce large quantities of an item that is then packaged into smaller, sellable quantities such as soft drinks or cereal. In these types of production environments, it easier to lump the costs of direct labor and overhead into one category, since these costs are what are needed to convert raw materials into a finished product. This method of costing is termed *process costing* and is covered in Process Costing.

Although it seems as if there are many classifications or labels associated with costs, remember that the purpose of cost classification is to assist managers in the decision-making process. Since this type of data is not used for external reporting purposes, it is important to understand that (1) a single cost can have many different labels; (2) the terms are used independently, not simultaneously; and (3) each classification is important to understand in order to make business decisions. Figure 2.25 uses some example costs to demonstrate these principles.

						Product				
Cost	Fixed	Variable	Mixed	Step	Period	DM	DL	OH	Prime	Conversion
Rent on production facility	√						OH			√
Plant supervisor salary	√						OH			√
Raw materials		√					DM		√	
Administrative salaries	√				√					
Commissioned sales staff		√	√		√					
Delivery truck			√		√					
Advertising	√				√					
Plant utilities			√				OH			√
Income tax		√		√	√					

Figure 2.25 Classification Based on Cost Function. Costs can fall into more than one category, sometimes making the process of cost identification complex. DM, direct materials; DL, direct labor; OH, overhead. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Effects of Changes in Activity Level on Unit Costs and Total Costs

We have spent considerable time identifying and describing the various ways that businesses categorize costs. However, categorization itself is not enough. It is important not only to understand the categorization of costs but to understand the relationships between changes in activity levels and the changes in costs in total. It is worth repeating that when a cost is considered to be fixed, that cost is only fixed for the relevant range. Once the boundary of the relevant range has been reached or moved beyond, fixed costs will change and then remain fixed for the new relevant range. Remember that, within a relevant range of activity, where the relevant range refers to a specific activity level that is bounded by a minimum and maximum amount, total fixed costs are constant, but costs change on a per-unit basis. Let's examine an example that demonstrates how changes in activity can affect costs.

ETHICAL CONSIDERATIONS

Cost Accounting Helps Reduce Fraud and Promotes Ethical Behavior

Managerial and related cost accounting systems assist managers in making ethical and sound business decisions. Managerial accountants implement accounting reporting systems to minimize or prevent fraud and promote ethical decision-making. For example, tracking changes in costing activity and ensuring that activity remains in a relevant range, helps ensure that an organization's business activity is properly bounded within a reasonable range of expense. If the minimum or maximum expense range is

exceeded, this can indicate that management is acting without authority or is pursuing unauthorized activities. Excessive costs may even be a red flag that possible fraud is occurring. Cost accounting helps ensure that financial costs are within an acceptable range and helps an organization make reliable forward-looking financial decisions.

Comprehensive Example of the Effect on Changes in Activity Level on Costs

Pat is planning a three-day ski trip on his spring break after he works on a Habitat for Humanity project in Dallas. The costs for the trip are as follows:

Car rental (up to five passengers)	$200
Condo rental (up to five occupants)	400
Gasoline	120
Food (per day)	40
Lift tickets (per day)	30

He is considering his costs for the trip if he goes alone, or if he takes one, two, three, or four friends. However, before he can begin his analysis, he needs to consider the characteristics of the costs. Some of the costs will stay the same no matter how many people go, and some of the costs will fluctuate, based on the number of participants.

Those costs that do not change are the fixed costs. Once you incur a fixed cost, it does not change within a given range. For example, Pat can take up to five people in one car, so the cost of the car is fixed for up to five people. However, if he took more friends, then he would need more cars. The condo rental and the gasoline expenses would also be considered fixed costs, because they are not going to change in the reference range.

The costs that do change as the number of participants change are the variable costs. The food and lift ticket expenses are examples of variable costs, since they fluctuate based upon the number of participants and the number of days of activities.

In analyzing the costs, Pat also needs to consider the total costs and average costs. The analysis will calculate the average fixed costs, the total fixed costs, the average variable costs, and the total variable costs.

In the analysis of total costs versus average costs, both total and average fixed costs will stay the same and total and average variable costs will change. Here are the total fixed costs:

Car rental	$200
Condo	400
Gasoline	120
Total fixed costs	$720

The total fixed costs for the trip will be $720.00, no matter whether Pat goes alone or takes up to 4 friends. However, the average fixed costs will be the total fixed costs divided by the number of participants. The average fixed cost could range from $720 (720/1) to $144 (720/5).

Here are the variable costs:

Food (per day)	$40
Lift tickets (per day)	30
Average variable cost (per day)	$70

The average variable cost will be $70.00 per person per day, no matter how many people go on the trip. However, the total variable costs will range from $70.00, if Pat goes alone, to $350.00, if five people go. Figure 2.26 shows the relationships of the various costs, based on the number of participants.

Number of Skiers	Average Variable Cost	Total Variable Cost	Total Fixed Cost	Average Fixed Cost	Average Cost per Skier
1	$210	$ 210	$720	$720	$930
2	210	420	720	360	570
3	210	630	720	240	450
4	210	840	720	180	390
5	210	1,050	720	144	354

Figure 2.26 Comprehensive Ski Trip Cost Classification. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Looking at this analysis, it is clear that, if there is an activity that you think that you cannot afford, it can become less expensive if you are creative in your cost-sharing techniques.

YOUR TURN

Spring Break Trip Planning

Margo is planning an 8-day spring break trip from Atlanta, Georgia, to Tampa, Florida, leaving on Sunday and returning the following Sunday. She has located a condominium on the beach and has put a deposit down on the unit. The rental company has a maximum occupancy for the condominium of seven adults. There is an amusement park that she plans to visit. She is going to use her parents' car, an SUV that can carry up to six people and their luggage. The SUV can travel an average of 20 miles per gallon, the total distance is approximately 1,250 miles (550 miles each way plus driving around Tampa every day), and the average price of gas is $3 per gallon. A season pass for an amusement park she wants to visit is $168 per person. Margo estimates spending $40 per day per person for food. She estimates the costs for the trip as follows:

Condo Rental	$1,400
Gasoline	188
Food (per person per day)	40
Amusement Park Season Pass (per person)	168

Now that she has cost estimates, she is trying to decide how many of her friends she wants to invite. Since the car can only seat six people, Marg made a list of five other girls to invite. Use her data to answer the following questions and fill out the cost table:

1. What are the total variable costs for the trip?
2. What are the average variable costs for the trip?

3. What are the total fixed costs for the trip?
4. What are the average fixed costs for the trip?
5. What are the average costs per person for the trip?
6. What would the trip cost Margo if she were to go alone?

Number of People, Including Margo	Total Variable Cost	Average Variable Cost	Total Fixed Cost	Average Fixed Cost	Average Cost per Person
1					
2					
3					
4					
5					
6					

7. What additional costs would be incurred if a seventh girl was invited on the trip? Would this be a wise decision (from a cost perspective)? Why or why not?
8. Which cost will *not* be affected if a seventh girl was invited on the trip?

Solution

Number of People, Including Margo	Total Variable Cost	Average Variable Cost	Total Fixed Cost	Average Fixed Cost	Average Cost per Person
1	$488	$488	$1,588	$1,588	$2,076
2	976	488	1,588	794	1,282
3	1,464	488	1,588	529	1,017
4	1,952	488	1,588	397	885
5	2,440	488	1,588	318	806
6	2,928	488	1,588	265	753

Answers will vary. All responses should recognize that there is no room in the car for the seventh girl and her luggage, although the condominium will accommodate the extra person. This means they will have to either find a larger vehicle and incur higher gas expenses or take a second car, which will at least double the fixed gas cost.

2.3 Estimate a Variable and Fixed Cost Equation and Predict Future Costs

Sometimes, a business will need to use cost estimation techniques, particularly in the case of mixed costs, so that they can separate the fixed and variable components, since only the variable components change in the short run. Estimation is also useful for using current data to predict the effects of future changes in production on total costs. Three estimation techniques that can be used include the scatter graph, the high-low method, and regression analysis. Here we will demonstrate the scatter graph and the high-low methods (you will learn the regression analysis technique in advanced managerial accounting courses.

Functions of Cost Equations

The cost equation is a linear equation that takes into consideration total fixed costs, the fixed component of mixed costs, and variable cost per unit. Cost equations can use past data to determine patterns of past costs that can then project future costs, or they can use estimated or expected future data to estimate future costs. Recall the mixed cost equation:

$$Y = a + bx$$

where Y is the total mixed cost, a is the fixed cost, b is the variable cost per unit, and x is the level of activity.

Let's take a more in-depth look at the cost equation by examining the costs incurred by Eagle Electronics in the manufacture of home security systems, as shown in Table 2.9.

Cost Information for Eagle Electronics

Cost Incurred	Fixed or Variable	Cost
Lease on manufacturing equipment	Fixed	$50,000 per year
Supervisor salary	Fixed	$75,000 per year
Direct materials	Variable	$50 per unit
Direct labor	Variable	$20 per unit

Table 2.9

By applying the cost equation, Eagle Electronics can predict its costs at any level of activity (x) as follows:

1. Determine total fixed costs: $50,000 + $75,000 = $125,000
2. Determine variable costs per unit: $50 + $20 = $70
3. Complete the cost equation: Y = $125,000 + 70x$

Using this equation, Eagle Electronics can now predict its total costs (Y) for any given level of activity (x), as in Figure 2.27:

Units Produced	Cost Equation	Total Costs
5,000	Y = $125,000 + ($70 × 5,000)	$475,000
8,000	Y = $125,000 + ($70 × 8,000)	685,000
12,000	Y = $125,000 + ($70 × 12,000)	965,000

Figure 2.27 Total Cost Estimation for Various Production Levels. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

When using this approach, Eagle Electronics must be certain that it is only predicting costs for its relevant range. For example, if they must hire a second supervisor in order to produce 12,000 units, they must go back and adjust the total fixed costs used in the equation. Likewise, if variable costs per unit change, these must also be adjusted.

This same approach can be used to predict costs for service and merchandising firms, as shown by examining

the costs incurred by J&L Accounting to prepare a corporate income tax return, shown in Table 2.10.

Cost Information for J&L Accounting

Cost Incurred	Fixed or Variable	Cost
Building rent	Fixed	$1,000 per month
Direct labor (for CPAs)	Variable	$250 per tax return
Secretarial staff	Fixed	$2,000 per month
Accounting clerks	Variable	$100 per return

Table 2.10

J&L wants to predict their total costs if they complete 25 corporate tax returns in the month of February.

1. Determine total fixed costs: $1,000 + $2,000 = $3,000
2. Determine variable costs per tax return: $250 + $100 = $350
3. Complete the cost equation: $Y = \$3{,}000 + \$350x$

Using this equation, J&L can now predict its total costs (Y) for the month of February when they anticipate preparing 25 corporate tax returns:

$$Y = \$3{,}000 + (\$350 \times 25)$$
$$Y = \$3{,}000 + \$8{,}750$$
$$Y = \$11{,}750$$

J&L can now use this predicted total cost figure of $11,750 to make decisions regarding how much to charge clients or how much cash they need to cover expenses. Again, J&L must be careful to try not to predict costs outside of the relevant range without adjusting the corresponding total cost components.

J&L can make predictions for their costs because they have the data they need, but what happens when a business wants to estimate total costs but has not collected data regarding per-unit costs? This is the case for the managers at the Beach Inn, a small hotel on the coast of South Carolina. They know what their costs were for June, but now they want to predict their costs for July. They have gathered the information in Figure 2.28.

Cost Incurred	Fixed or Variable	June Costs
Insurance	Fixed	$ 700
Loan Payment	Fixed	2,500
Front Desk Staff	Variable	3,800
Cleaning Staff	Variable	2,500
Laundry Service	Variable	1,200

Figure 2.28 Monthly Total Cost Detail for Beach Inn. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

In June, they had an occupancy of 75 nights. For the Beach Inn, occupancy (rooms rented) is the cost driver. Since they know what is driving their costs, they can determine their per-unit variable costs in order to forecast

future costs:

$$\frac{\text{Front Desk Staff}}{75 \text{ nights}} = \frac{\$3{,}800}{75} = \$50.67 \text{ variable front desk staff co ts per night}$$

$$\frac{\text{Cleaning Staff}}{75 \text{ nights}} = \frac{\$2{,}500}{75} = \$33.33 \text{ variable cleaning staff co ts per night}$$

$$\frac{\text{Laundry Service}}{75 \text{ nights}} = \frac{\$1{,}200}{75} = \$16.00 \text{ variable laundry service costs per night}$$

Now, the Beach Inn can apply the cost equation in order to forecast total costs for any number of nights, within the relevant range.

1. Determine total fixed costs: $700 + $2,500 = $3,200
2. Determine variable costs per night of occupancy: $50.67 + $33.33 + $16.00 = $100
3. Complete the cost equation: Y = $3,200 + 100x$

Using this equation, the Beach Inn can now predict its total costs (Y) for the month of July, when they anticipate an occupancy of 93 nights.

$$Y = \$3{,}200 + (\$100 \times 93)$$
$$Y = \$3{,}200 + \$9{,}300$$
$$Y = \$12{,}500$$

In all three examples, managers used cost data they have collected to forecast future costs at various activity levels.

YOUR TURN

Waymaker Furniture

Waymaker Furniture has collected cost information from its production process and now wants to predict costs for various levels of activity. They plan to use the cost equation to formulate these predictions. Information gathered from March is presented in Table 2.11.

March Cost Information for Waymaker Furniture

Cost Incurred	Fixed or Variable	March Cost
Plant supervisor salary	Fixed	$12,000 per month
Lumber (direct materials)	Variable	$75,000 total
Production worker wages	Variable	$11.00 per hour
Machine maintenance	Variable	$5.00 per unit produced
Lease on factory	Fixed	$15,000 per month

Table 2.11

In March, Waymaker produced 1,000 units and used 2,000 hours of production labor.

Using this information and the cost equation, predict Waymaker's total costs for the levels of production in Table 2.12.

Waymaker's Levels of Production

Month	Activity Level
April	1,500 units
May	2,000 units
June	2,500 units

Table 2.12

Solution

Total Fixed Cost = $12,000 + $15,000 = $27,000. Direct Materials per Unit = $75,000 / 1,000 Units = $75 per unit. Direct Labor per Hour = $11.00. Machine Maintenance = $5.00 per unit. Total Variable Cost per Unit = $75 + $11 + $5 = $91 per unit.

Month	Activity Level	VC per Unit	Total VC	Fixed Cost	Total Cost
April	1,500 Units	$91	$136,500	$27,000	$163,500
May	2,000 Units	91	182,000	27,000	209,000
June	2,500 Units	91	227,500	27,000	254,500

Demonstration of the Scatter Graph Method to Calculate Future Costs at Varying Activity Levels

One of the assumptions that managers must make in order to use the cost equation is that the relationship between activity and costs is linear. In other words, costs rise in direct proportion to activity. A diagnostic tool that is used to verify this assumption is a scatter graph.

A **scatter graph** shows plots of points that represent actual costs incurred for various levels of activity. Once the scatter graph is constructed, we draw a line (often referred to as a *trend line*) that appears to best fit the pattern of dots. Because the trend line is somewhat subjective, the scatter graph is often used as a preliminary tool to explore the possibility that the relationship between cost and activity is generally a linear relationship. When interpreting a scatter graph, it is important to remember that different people would likely draw different lines, which would lead to different estimations of fixed and variable costs. No one person's line and cost estimates would necessarily be right or wrong compared to another; they would just be different. After using a scatter graph to determine whether cost and activity have a linear relationship, managers often move on to more precise processes for cost estimation, such as the high-low method or least-squares regression analysis.

To demonstrate how a company would use a scatter graph, let's turn to the data for Regent Airlines, which operates a fleet of regional jets serving the northeast United States. The Federal Aviation Administration establishes guidelines for routine aircraft maintenance based upon the number of flight hours. As a result, Regent finds that its maintenance costs vary from month to month with the number of flight hours, as depicted in Figure 2.29.

Month	Activity Level (Flight Hours)	Maintenance Costs
January	21,000	$84,000
February	23,000	90,000
March	14,000	70,500
April	17,000	75,000
May	10,000	64,500
June	19,000	78,000

Figure 2.29 Monthly Maintenance Cost and Activity Detail for Regent Airlines. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

When creating the scatter graph, each point will represent a pair of activity and cost values. Maintenance costs are plotted on the vertical axis (*Y*), while flight hours are plotted on the horizontal axis (*X*). For instance, one point will represent 21,000 hours and $84,000 in costs. The next point on the graph will represent 23,000 hours and $90,000 in costs, and so forth, until all of the pairs of data have been plotted. Finally, a trend line is added

to the chart in order to assist managers in seeing if there is a positive, negative, or zero relationship between the activity level and cost. Figure 2.30 shows a scatter graph for Regent Airlines.

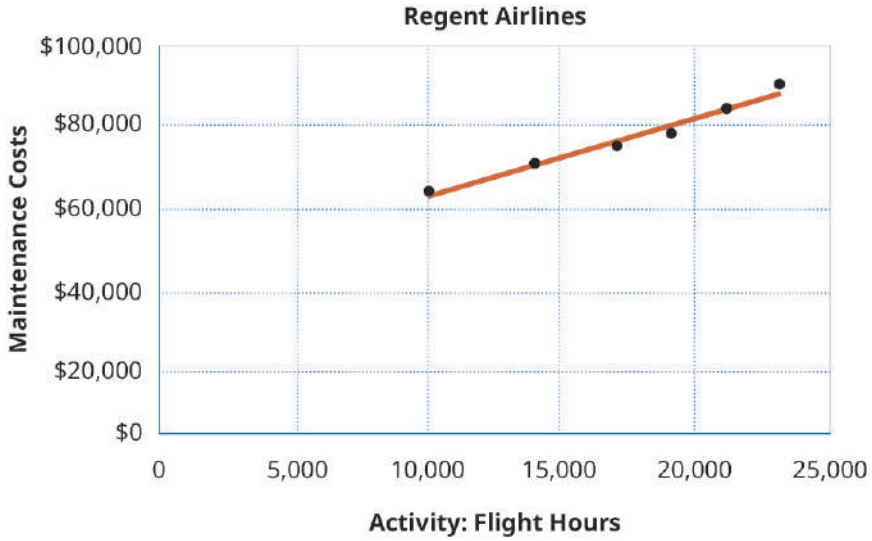


Figure 2.30 Scatter Graph of Maintenance Costs for Regent Airline. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

In scatter graphs, cost is considered the dependent variable because cost *depends* upon the level of activity. The activity is considered the independent variable since it is the cause of the variation in costs. Regent's scatter graph shows a positive relationship between flight hours and maintenance costs because, as flight hours increase, maintenance costs also increase. This is referred to as a positive linear relationship or a linear cost behavior.

Will all cost and activity relationships be linear? Only when there is a relationship between the activity and that particular cost. What if, instead, the cost of snow removal for the runways is plotted against flight hours? Suppose the snow removal costs are as listed in Table 2.13.

Snow Removal Costs

Month	Activity Level: Flight Hours	Snow Removal Costs
January	21,000	$40,000
February	23,000	50,000
March	14,000	8,000
April	17,000	0
May	10,000	0
June	19,000	0

Table 2.13

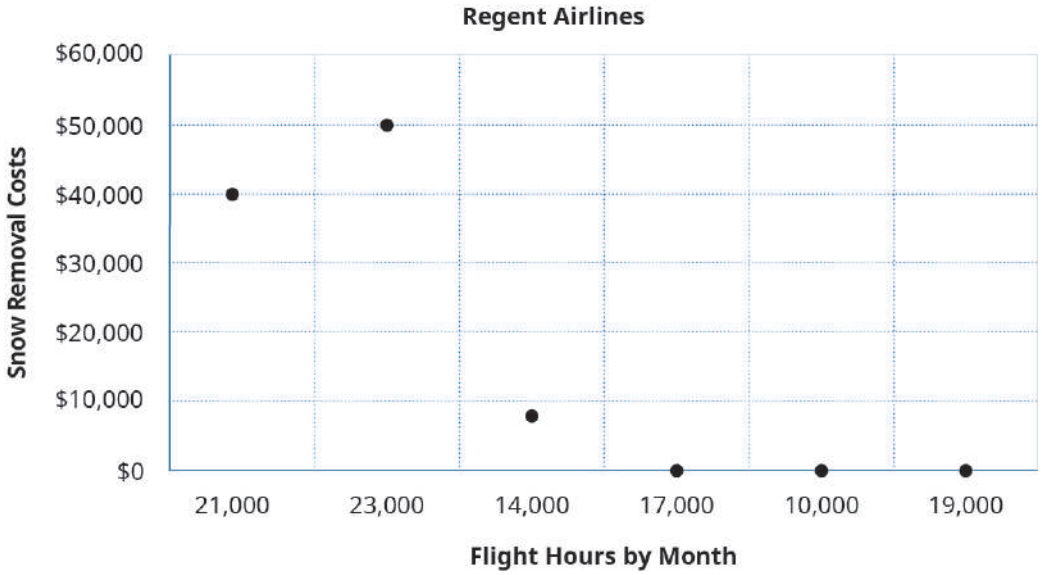


Figure 2.31 Scatter Graph of Snow Removal Costs for Regent Airlines. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

As you can see from the scatter graph, there is really not a linear relationship between how many flight hours are flown and the costs of snow removal. This makes sense as snow removal costs are linked to the amount of snow and the number of flights taking off and landing but not to how many hours the planes fly.

Using a scatter graph to determine if this linear relationship exists is an essential first step in cost behavior analysis. If the scatter graph reveals a linear cost behavior, then managers can proceed with a more sophisticated analyses to separate mixed costs into their fixed and variable components. However, if this linear relationship is not present, then other methods of analysis are not appropriate. Let's examine the cost data from Regent Airline using the high-low method.

Demonstration of the High-Low Method to Calculate Future Costs at Varying Activity Levels

As you've learned, the purpose of identifying costs is to control them, and managers regularly use past costs to predict future costs. Since we know that variable costs change with the level of activity, we can conclude that there is *usually* a positive relationship between cost and activity: As one rises, so does the other. Ideally, this can be confirmed on a scatter graph. One of the simplest ways to analyze costs is to use the **high-low method**, a technique for separating the fixed and variable cost components of mixed costs. Using the highest and lowest levels of activity and their associated costs, we are able to estimate the variable cost components of mixed costs.

Once we have established that there is linear cost behavior, we can equate variable costs with the slope of the line, expressed as the rise of the line over the run. The steeper the slope of the line, the faster costs rise in response to a change in activity. Recall from the scatter graph that costs are the dependent *Y* variable and activity is the independent *X* variable. By examining the change in *Y* relative to the change in *X*, we can predict cost:

$$\text{Variable Cost} = \frac{\text{Rise of the line}}{\text{Run of the line}} = \frac{Y_2 - Y_1}{X_2 - X_1}$$

where Y_2 is the total cost at the highest level of activity; Y_1 is the total cost at the lowest level of activity; X_2 is the number of units, labor hours, etc., at the highest level of activity; and X_1 is the number of units, labor hours, etc., at the lowest level of activity.

Using the maintenance cost data from Regent Airlines shown in Figure 2.32, we will examine how this method works in practice.

Month	Activity Level (Flight Hours)	Maintenance Costs
January	21,000	$84,000
February	23,000	90,000
March	14,000	70,500
April	17,000	75,000
May	10,000	64,500
June	19,000	78,000

Figure 2.32 Monthly Maintenance Cost and Activity Detail for Regent Airlines. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

The first step in analyzing mixed costs with the high-low method is to identify the periods with the highest and lowest levels of activity. In this case, it would be February and May, as shown in Figure 2.33. We always choose the highest and lowest activity and the costs that correspond with those levels of activity, even if they are not the highest and lowest costs.

	Activity Level (Flight Hours)	Cost (Maintenance Costs)
Highest level (February)	23,000	$90,000
Lowest level (May)	10,000	64,500

Figure 2.33 High–Low Data Points for Regent Airlines Maintenance Costs. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

We are now able to estimate the variable costs by dividing the difference between the costs of the high and the low periods by the change in activity using this formula:

$$\text{Variable Cost} = \frac{\text{Change in Cost}}{\text{Change in Activity}} = \frac{\text{Cost at the high activity level – Cost at the low activity level}}{\text{Highest activity level – Lowest activity level}}$$

For Regent Airlines, this is:

$$\text{Variable Cost} = \frac{\$90{,}000 - \$64{,}500}{23{,}000 - 10{,}000} = \$1.96 \text{ per flight hou}$$

Having determined that the variable cost per flight-hour is $1.96, we can now determine the amount of fixed costs. We can determine these fixed costs by taking the total costs at *either* the high or the low level of activity and subtracting this variable component. You will recall that total cost = fixed costs + variable costs, so the fixed cost component for Regent Airlines can be isolated as shown:

$$\text{Fixed cost} = \text{total cost} - \text{variable cost}$$
$$\text{Fixed cost} = \$90{,}000 - (23{,}000 \times \$1.96)$$
$$\text{Fixed cost} = \$44{,}920$$

Notice that if we had chosen the other data point, the low cost and activity, we would still get the same fixed cost of $44,920 = [$64,500 – (10,000 × $1.96)].

Now that we have isolated both the fixed and the variable components, we can express Regent Airlines' cost of maintenance using the total cost equation:

$$Y = \$44{,}920 + \$1.96x$$

where *Y* is total cost and *x* is flight hours.

Because we confirmed that the relationship between cost and activity at Regent exhibits linear cost behavior on the scatter graph, this equation allows managers at Regent Airlines to conclude that for every one unit increase in activity, there will be a corresponding rise in variable cost of $1.96. When put into practice, the managers at Regent Airlines can now predict their total costs at any level of activity, as shown in Figure 2.34.

Activity Level (Flight Hours)	Fixed Costs	Variable Cost at $1.96 per hour	Total Costs
10,000	$44,920	$19,600	$64,520
20,000	44,920	39,200	84,120
30,000	44,920	58,800	103,720
40,000	44,920	78,400	123,320

Figure 2.34 Predictions of Total Cost and Cost Components at Different Levels of Activity for Regent Airlines. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Although managers frequently use this method, it is not the most accurate approach to predicting future costs because it is based on only two pieces of cost data: the highest and the lowest levels of activity. Actual costs can vary significantly from these estimates, especially when the high or low activity levels are not representative of the usual level of activity within the business. For a more accurate model, the least-squares regression method would be used to separate mixed costs into their fixed and variable components. The least-squares regression method is a statistical technique that may be used to estimate the total cost at the given level of activity based on past cost data. Least-squares regression minimizes the errors of trying to fit a line between the data points and thus fits the line more closely to all the data points.

Understanding the various labels used for costs is the first step toward using costs to evaluate business decisions. You will learn more about these various labels and how they are applied in decision-making processes as you continue your study of managerial accounting in this course.

Key Terms

average fixed cost (AFC) total fixed costs divided by the total number of units produced, which results in a per-unit cost

average variable cost (AVC) total variable costs divided by the total number of units produced, which results in a per-unit cost

conversion costs total of labor and overhead for a product; the costs that "convert" the direct material into the finished product

cost driver activity that is the reason for the increase or decrease of another cost; examples include labor hours incurred, labor costs paid, amounts of materials used in production, units produced, or any other activity that has a cause-and-effect relationship with incurred costs

direct labor labor directly related to the manufacturing of the product or the production of a service

direct materials materials used in the manufacturing process that can be traced directly to the product

fixed cost unavoidable operating expense that does not change in total, regardless of the level of activity

high-low method technique for separating the fixed and variable cost components of mixed costs

indirect labor labor not directly involved in the active conversion of materials into finished products or the provision of services

indirect materials materials used in production but not efficiently traceable to a specific unit of production

intangible good good with financial value but no physical presence; examples include copyrights, patents, goodwill, and trademarks

manufacturing organization business that uses parts, components, or raw materials to produce finished goods

manufacturing overhead costs incurred in the production process that are not economically feasible to measure as direct material or direct labor costs; examples include indirect material, indirect labor, utilities, and depreciation

merchandising firm business that purchases finished products and resells them to consumers

mixed costs expenses that have a fixed component and a variable component

period costs typically related to a particular time period instead of attached to the production of an asset; treated as an expense in the period incurred (examples include many sales and administrative expenses)

prime costs direct material expenses and direct labor costs

product costs all expenses required to manufacture the product: direct materials, direct labor, and manufacturing overhead

relevant range quantitative range of units that can be produced based on the company's current productive assets; for example, if a company has sufficient fixed assets to produce up to 10,000 units of product, the relevant range would be between 0 and 10,000 units

scatter graph plot of pairs of numerical data that represents actual costs incurred for various levels of activity, with one variable on each axis, used to determine whether there is a relationship between them

service organization business that earns revenue primarily by providing an intangible product

stepped cost one that changes with the level of activity but will remain constant within a relevant range

tangible good physical good that customers can handle and see

total cost sum of all fixed and all variable costs

total fixed costs sum of all fixed costs

total variable costs sum of all variable costs

variable cost one that varies in direct proportion to the level of activity within the business

Summary

2.1 Distinguish between Merchandising, Manufacturing, and Service Organizations

- Merchandising, manufacturing, and service organizations differ in what they provide to consumers; however, all three types of firms must control costs in order to remain profitable. The type of costs they incur is primarily determined by the product/good, or service they provide.
- As the type of organization differs, so does the way they account for costs. Some of these differences are reflected in the income statement.

2.2 Identify and Apply Basic Cost Behavior Patterns

- Costs can be broadly classified as either fixed or variable costs. However, in order for managers to manage effectively, these two cost classifications are often further expanded to include mixed, step, prime, and conversion costs.
- For manufacturing firms, it is essential that they differentiate among direct materials, direct labor, and manufacturing overhead in order to identify and manage their total product costs.
- For planning purposes, managers must be careful to consider the relevant range because it is only within this relevant range that total fixed costs remain constant.

2.3 Estimate a Variable and Fixed Cost Equation and Predict Future Costs

- In order to make business decisions, managers can utilize past cost data to predict future costs employing three methods: scatter graphs, the high-low method, and least-squares regression analysis.
- Scatter graphs are used as a diagnostic tool to determine if the relationship between activity and cost is a linear relationship.
- Both the high-low method and the least-squares regression method separate mixed costs into their fixed and variable components to allow managers to predict future costs from historical costs.

Multiple Choice

1. LO 2.1 Which of the following is the primary source of revenue for a service business?

A. the production of products from raw materials
B. the purchase and resale of finished products
C. providing intangible goods and services
D. the sale of raw materials to manufacturing firms

2. LO 2.1 Which of the following is the primary source of revenue for a merchandising business?

A. the production of products from raw materials
B. the purchase and resale of finished products
C. the provision of intangible goods and services
D. the sale of raw materials to manufacturing firms

3. LO 2.1 Which of the following is the primary source of revenue for a manufacturing business?

A. the production of products from raw materials
B. the purchase and resale of finished products
C. the provision of intangible goods and services
D. both the provision of services and the sale of finished goods

4. LO 2.1 Which of the following represents the components of the income statement for a service business?

A. Sales Revenue – Cost of Goods Sold = gross profit
B. Service Revenue – Operating Expenses = operating income
C. Sales Revenue – Cost of Goods Manufactured = gross profit
D. Service Revenue – Cost of Goods Purchased = gross profit

5. LO 2.1 Which of the following represents the components of the income statement for a manufacturing business?

A. Sales Revenue – Cost of Goods Sold = gross profit
B. Service Revenue – Operating Expenses = gross profit
C. Service Revenue – Cost of Goods Manufactured = gross profit
D. Sales Revenue – Cost of Goods Manufactured = gross profit

6. LO 2.1 Which of the following represents the components of the income statement for a merchandising business?

A. Sales Revenue – Cost of Goods Sold = gross profit
B. Service Revenue – Operating Expenses = gross profit
C. Sales Revenue – Cost of Goods Manufactured = gross profit
D. Service Revenue – Cost of Goods Purchased = gross profit

7. LO 2.2 Conversion costs include all of the following *except*:

A. wages of production workers
B. depreciation on factory equipment
C. factory utilities
D. direct materials purchased

8. LO 2.2 Which of the following is *not* considered a product cost?

A. direct materials
B. direct labor
C. indirect materials
D. selling expense

9. LO 2.2 Fixed costs are expenses that _____.

A. vary in response to changes in activity level
B. remain constant on a per-unit basis
C. increase on a per-unit basis as activity increases
D. remain constant as activity changes

10. LO 2.2 Variable costs are expenses that _____.

A. remain constant on a per-unit basis but change in total based on activity level
B. remain constant on a per-unit basis and remain constant in total regardless of activity level
C. decrease on a per-unit basis as activity level increases
D. remain constant in total regardless of activity level within a relevant range

11. LO 2.2 Total costs for ABC Distributing are $250,000 when the activity level is 10,000 units. If variable costs are $5 per unit, what are their fixed costs?

A. $240,000
B. $200,000
C. $260,000
D. Their fixed costs cannot be determined from the information presented.

12. LO 2.2 Which of the following would not be classified as manufacturing overhead?

A. indirect materials
B. indirect labor
C. direct labor
D. property taxes on factory

13. LO 2.2 Which of the following are prime costs?

A. indirect materials, indirect labor, and direct labor
B. direct labor, indirect materials, and indirect labor
C. direct labor and indirect labor
D. direct labor and direct materials

14. LO 2.2 Which of the following statements is true regarding average fixed costs?

A. Average fixed costs per unit remain fixed regardless of level of activity.
B. Average fixed costs per unit rise as the level of activity rises.
C. Average fixed costs per unit fall as the level of activity rises.
D. Average fixed costs per unit cannot be determined.

15. LO 2.3 The high-low method and least-squares regression are used by managers to _____.

A. decide whether to make or buy a component part
B. minimize corporate tax liability
C. maximize output
D. estimate costs

16. LO 2.3 Which of the following methods of cost estimation relies on only two data points?

A. the high-low method
B. account analysis
C. least-squares regression
D. SWOT analysis.

17. LO 2.3 In the cost equation $Y = a + bx$, Y represents which of the following?

A. fixed costs
B. variable costs
C. total costs
D. units of production

18. LO 2.3 A scatter graph is used to test the assumption that the relationship between cost and activity level is _____.

A. curvilinear
B. cyclical
C. unpredictable
D. linear

Questions

1. LO 2.1 Identify the three primary classifications of businesses and explain the differences among the three.

2. LO 2.1 Explain how the income statement of a manufacturing company differs from the income statement of a merchandising company.

3. LO 2.1 Walsh & Coggins, a professional accounting firm, collects cost information about the services they provide to their clients. Describe the types of cost data they would collect and explain the importance of analyzing this cost data.

4. LO 2.1 Lizzy's is a retail clothing store, specializing in formal wear for weddings. They purchase their clothing for resale from specialty distributors and manufacturers. Recently the owners of Lizzy's have noted an increased interest in costume jewelry and fashion accessories among their clientele. If the owners of Lizzy's decide to expand their business to include these products, what cost data would they need to collect and analyze prior to expanding the business?

5. LO 2.2 Identify and describe the three types of product costs in a manufacturing firm.

6. LO 2.2 Explain the difference between a period cost and a product cost.

7. LO 2.2 Explain the concept of relevant range and how it affects total fixed costs.

8. LO 2.2 Explain the differences among fixed costs, variable costs, and mixed costs.

9. LO 2.2 Explain the difference between prime costs and conversion costs.

10. LO 2.3 Explain how a scatter graph is used to identify and measure cost behavior.

11. LO 2.3 Explain the components of the total cost equation and describe how each of the components can be used by management for decision-making.

12. LO 2.3 Explain how the high-low method is used for cost estimation. What, if any, are the limitations of this approach to cost estimation?

Exercise Set A

EA1. LO 2.1 Magio Company manufactures kitchen equipment used in hospitals. They distribute their products directly to the customer and, for the year ending 2019, they reported the these revenues and expenses. Use this information to construct an income statement for the year 2019.

Sales revenue	$985,000
Cost of goods sold	489,000
Operating expenses	245,000

EA2. LO 2.1 Park and West, LLC, provides consulting services to retail merchandisers in the Midwest. In 2019, they generated $720,000 in service revenue. Their total cost (fixed and variable) per client was $2,500 and they served 115 clients during the year. If operating expenses for the year were $302,000 what was their net income?

EA3. LO 2.1 Canine Couture is a specialty dog clothing boutique that sells clothing and clothing accessories for dogs. In 2019, they had gross revenue from sales totaling $86,500. Their operating expenses for this same period were $27,500. If their Cost of Goods Sold (COGS) was 24% of gross revenue, what was their net operating income for the year?

EA4. LO 2.2 Hicks Contracting collects and analyzes cost data in order to track the cost of installing decks on new home construction jobs. The following are some of the costs that they incur. Classify these costs as fixed or variable costs and as product or period costs.

A. Lumber used to construct decks ($12.00 per square foot)
B. Carpenter labor used to construct decks ($10 per hour)
C. Construction supervisor salary ($45,000 per year)
D. Depreciation on tools and equipment ($6,000 per year)
E. Selling and administrative expenses ($35,000 per year)
F. Rent on corporate office space ($34,000 per year)
G. Nails, glue, and other materials required to construct deck (varies per job)

EA5. LO 2.2 Rose Company has a relevant range of production between 10,000 and 25,000 units. The following cost data represents average cost per unit for 15,000 units of production.

	Average Cost per Unit
Direct materials	$12
Direct labor	10
Indirect materials	2
Fixed manufacturing overhead	4
Variable manufacturing overhead	3
Fixed selling and administrative expenses	8
Variable sales commissions	25

Using the cost data from Rose Company, answer the following questions:

A. If 10,000 units are produced, what is the variable cost per unit?
B. If 18,000 units are produced, what is the variable cost per unit?
C. If 21,000 units are produced, what are the total variable costs?
D. If 11,000 units are produced, what are the total variable costs?
E. If 19,000 units are produced, what are the total manufacturing overhead costs incurred?
F. If 23,000 units are produced, what are the total manufacturing overhead costs incurred?
G. If 19,000 units are produced, what are the per unit manufacturing overhead costs incurred?
H. If 25,000 units are produced, what are the per unit manufacturing overhead costs incurred?

EA6. LO 2.2 Carr Company provides human resource consulting services to small- and medium-sized companies. Last year, Carr provided services to 700 clients. Total fixed costs were $159,000 with total variable costs of $87,500. Based on this information, complete this chart:

	500 Clients	800 Clients	900 Clients
Total costs			
Fixed costs	?	?	?
Variable costs	?	?	?
Total costs	?	?	?
Cost per client			
Fixed cost	?	?	?
Variable cost	?	?	?
Total cost per client	?	?	?

EA7. LO 2.2 Western Trucking operates a fleet of delivery trucks. The fixed expenses to operate the fleet are $79,900 in March and rose to $93,120 in April. It costs Western Trucking $0.15 per mile in variable costs. In March, the delivery trucks were driven a total of 85,000 miles, and in April, they were driven a total of 96,000 miles. Using this information, answer the following:

A. What were the total costs to operate the fleet in March and April, respectively?
B. What were the cost per mile to operate the fleet in March and April, respectively?

EA8. LO 2.2 Suppose that a company has fixed costs of $18 per unit and variable costs $9 per unit when 15,000 units are produced. What are the fixed costs per unit when 12,000 units are produced?

EA9. LO 2.3 The cost data for Evencoat Paint for the year 2019 is as follows:

Month	Gallons of Paint Produced	Equipment Maintenance Expenses
January	110,000	$70,700
February	68,000	66,800
March	71,000	67,000
April	77,000	68,100
May	95,000	69,200
June	101,000	70,300
July	125,000	70,400
August	95,000	68,900
September	95,000	69,500
October	89,000	68,600
November	128,000	72,800
December	122,000	71,450

A. Using the high-low method, express the company's maintenance costs as an equation where *x* represents the gallons of paint produced. Then estimate the fixed and variable costs.
B. Predict the maintenance costs if 90,000 gallons of paint are produced.
C. Predict the maintenance costs if 81,000 gallons of paint are produced.
D. Using Excel, create a scatter graph of the cost data and explain the relationship between gallons of paint produced and equipment maintenance expenses.

EA10. LO 2.3 This cost data from Hickory Furniture is for the year 2017.

Month	Number of Tables Produced	Factory Utility Expenses
January	550	$2,063
February	710	2,663
March	650	2,438
April	470	1,823
May	512	1,920
June	625	2,344
July	805	3,019
August	750	2,813
September	675	2,531
October	525	1,969
November	875	3,281
December	685	2,569

A. Using the high-low method, express the company's utility costs as an equation where *X* represents number of tables produced.
B. Predict the utility costs if 800 tables are produced.
C. Predict the utility costs if 600 tables are produced.
D. Using Excel, create a scatter graph of the cost data and explain the relationship between number of tables produced and utility expenses.

EA11. LO 2.3 Markson and Sons leases a copy machine with terms that include a fixed fee each month plus a charge for each copy made. Markson made 9,000 copies and paid a total of $480 in January. In April, they paid $320 for 5,000 copies. What is the variable cost per copy if Markson uses the high-low method to analyze costs?

EA12. LO 2.3 Markson and Sons leases a copy machine with terms that include a fixed fee each month of $500 plus a charge for each copy made. The company uses the high-low method to analyze costs. If Markson paid $360 for 5,000 copies and $280 for 3,000 copies, how much would Markson pay if it made 7,500 copies?

Exercise Set B

EB1. LO 2.1 Winterfell Products manufactures electrical switches for the aerospace industry. For the year ending 2019, they reported these revenues and expenses. Use this information to construct an income statement for the year 2019.

Sales revenue	$865,000
Cost of goods sold	354,000
Operating expenses	315,000

EB2. LO 2.1 CPK & Associates is a mid-size legal firm, specializing in closings and real estate law in the south. In 2019, they generated $945,000 in sales revenue. Their expenses related to this year's revenue are shown:

Operating expenses (including salaries)	$312,000
Cost of services	
Total cost per client	1,750
Clients served in 2019	225

Based on the information provided for the year, what was their net operating income?

EB3. LO 2.1 Flip or Flop is a retail shop selling a wide variety of sandals and beach footwear. In 2019, they had gross revenue from sales totaling $93,200. Their operating expenses for this same period were $34,000. If their Cost of Goods Sold (COGS) was 21% of gross revenue, what was their net operating income for the year?

EB4. Roper Furniture manufactures office furniture and tracks cost data across their process. The following are some of the costs that they incur. Classify these costs as fixed or variable costs, and as product costs or period costs.

A. Wood used to produce desks ($125.00 per desk)
B. Production labor used to produce desks ($15 per hour)
C. Production supervisor salary ($45,000 per year)
D. Depreciation on factory equipment ($60,000 per year)
E. Selling and administrative expenses ($45,000 per year)
F. Rent on corporate office ($44,000 per year)
G. Nails, glue, and other materials required to produce desks (varies per desk)
H. Utilities expenses for production facility
I. Sales staff commission (5% of gross sales)

EB5. LO 2.2 Baxter Company has a relevant range of production between 15,000 and 30,000 units. The following cost data represents average variable costs per unit for 25,000 units of production.

	Average Cost per Unit
Direct materials	$10
Direct labor	9
Indirect materials	3
Fixed manufacturing overhead	6
Variable manufacturing overhead	2
Fixed selling and administrative expenses	8
Variable sales commissions	14

Using the costs data from Rose Company, answer the following questions:

A. If 15,000 units are produced, what is the variable cost per unit?
B. If 28,000 units are produced, what is the variable cost per unit?
C. If 21,000 units are produced, what are the total variable costs?
D. If 29,000 units are produced, what are the total variable costs?
E. If 17,000 units are produced, what are the total manufacturing overhead costs incurred?
F. If 23,000 units are produced, what are the total manufacturing overhead costs incurred?
G. If 30,000 units are produced, what are the per unit manufacturing overhead costs incurred?
H. If 15,000 units are produced, what are the per unit manufacturing overhead costs incurred?

EB6. LO 2.2 Sanchez & Vukmin, LLP, is a full-service accounting firm located near Chicago, Illinois.

Last year, Sanchez provided tax preparation services to 500 clients. Total fixed costs were $265,000 with total variable costs of $180,000. Based on this information, complete this chart.

	500 Clients	800 Clients	900 Clients
Total costs			
Fixed costs	?	?	?
Variable costs	?	?	?
Total costs	?	?	?
Cost per client			
Fixed cost	?	?	?
Variable cost	?	?	?
Total cost per client	?	?	?

EB7. LO 2.2 Case Airlines provides charter airline services. The fixed expenses to operate the company's aircraft are $377,300 in January and $378,880 in February. It costs Case Airlines $0.45 per mile in variable costs. In January, Case aircraft flew a total of 385,000 miles, and in February, Case aircraft flew a total of 296,000 miles. Using this information, answer the following:

A. What were the total costs to operate the aircraft in January and February, respectively?
B. What were the total costs per mile to operate the fleet in January and February, respectively?

EB8. LO 2.2 Suppose that a company has fixed costs of $11 per unit and variable costs $6 per unit when 11,000 units are produced. What are the fixed costs per unit when 20,000 units are produced?

EB9. LO 2.3 The cost data for BC Billing Solutions for the year 2020 is as follows:

Month	Invoices Processed	Overtime Wages
January	12,000	$7,760
February	8,000	6,800
March	1,000	6,000
April	7,000	6,100
May	5,000	6,200
June	10,000	7,300
July	11,000	7,400
August	9,000	6,900
September	5,000	6,500
October	9,000	6,600
November	8,000	6,800
December	11,000	7,450

A. Using the high-low method, express the company's overtime wages as an equation where *x* represents number of invoices processed. Assume BC has monthly fixed costs of $3,800.
B. Predict the overtime wages if 9,000 invoices are processed.
C. Predict the overtime wages if 6,500 invoices are processed.
D. Using Excel, create a scatter graph of the cost data and explain the relationship between the number of invoices processed and overtime wage expense.

EB10. LO 2.3 This cost data from Hickory Furniture is for the year 2017.

Month	Number of Chairs Produced	Factory Utility Expenses
January	425	$1,659
February	510	1,964
March	625	2,406
April	725	2,791
May	685	2,637
June	575	2,214
July	510	1,964
August	810	3,119
September	700	2,695
October	650	2,503
November	875	3,369
December	680	2,618

A. Using the high-low method, express the factory utility expenses as an equation where *x* represents number of chairs produced.
B. Predict the utility costs if 900 chairs are produced.
C. Predict the utility costs if 750 chairs are produced.
D. Using Excel, create a scatter graph of the cost data and explain the relationship between number of chairs processed and utility expenses.

EB11. LO 2.3 Able Transport operates a tour bus that they lease with terms that involve a fixed fee each month plus a charge for each mile driven. Able Transport drove the tour bus 4,000 miles and paid a total of $1,250 in March. In April, they paid $970 for 3,000 miles. What is the variable cost per mile if Able Transport uses the high-low method to analyze costs?

EB12. LO 2.3 Able Transport operates a tour bus that they lease with terms that involve a fixed fee each month plus a charge for each mile driven. Able Transport drove the bus 7,000 miles and paid a total of $1,360 in June. In October, Able Transport paid $1,280 for the 5,000 miles driven. If Able Transport uses the high-low method to analyze costs, how much would Able Transport pay in December, if they drove 6,000 miles?

Problem Set A

PA1. LO 2.1 Ballentine Manufacturing produces and sells lawnmowers through a national dealership network. They purchase raw materials from a variety of suppliers, and all manufacturing and assembly work is performed at their plant outside of Kansas City, Missouri. They recorded these costs for the year ending December 31, 2017. Construct an income statement for Ballentine Manufacturing to reflect their net income for 2017.

Administrative and selling expenses	$ 425,000
Cost of goods sold	1,400,000
Rent on corporate headquarters	75,000
Marketing and advertising	400,000
Sales revenue	2,700,000
Straight-line depreciation on office equipment	100,000

PA2. LO 2.1 Tom West is a land surveyor who operates a small surveying company, performing surveys for both residential and commercial clients. He has a staff of surveyors and engineers who are employed by the firm. For the year ending December 31, 2017, he reported these income and expenses. Using this information, construct an income statement to reflect his net income for 2017.

Service income	$850,000
Surveyor salary	124,000
Supplies and materials	32,000
Utilities	14,000
Office rent	24,000
Administrative expenses	115,000

PA3. LO 2.1 Just Beachy is a retail business located on the coast of Florida where it sells a variety of beach apparel, T-shirts, and beach-related souvenir items. They purchase all of their inventory from wholesalers and distributors. For the year ending December 31, 2017, they reported these revenues and expenses. Using this information, prepare an income statement for Just Beachy for 2017.

Sales revenue	$685,000
Building rent	48,000
Advertising	50,000
Sales staff salaries	85,000
Cost of goods sold	315,000
Utilities	23,000
Supplies	9,000

PA4. LO 2.2 Listed as follows are various costs found in businesses. Classify each cost as a fixed or variable cost, and as a product and/or period cost.

A. Wages of administrative staff
B. Shipping costs on merchandise sold
C. Wages of workers assembling computers
D. Cost of lease on factory equipment
E. Insurance on factory
F. Direct materials used in production of lamps
G. Supervisor salary, factory
H. Advertising costs
I. Property taxes, factory
J. Health insurance cost for company executives
K. Rent on factory

PA5. LO 2.2 Wachowski Company reported these cost data for the year 2017.

Factory maintenance costs	$ 90,000
Direct labor, wages	352,000
Direct labor, health insurance	32,000
Indirect labor, health insurance	15,000
Health insurance for production supervisor	6,500
Administrative costs	55,000
Rental of office space for administrative staff	17,500
Sales commissions	52,500
Direct material	1,230,000
Indirect materials	632,000
Advertising expense	39,000
Depreciation on factory building	62,000
Indirect labor, wages	70,000
Production supervisor's salary	32,000

Use the data to complete the following table.

Total prime costs	
Total manufacturing overhead costs	
Total conversion costs	
Total product costs	
Total period costs	

PA6. LO 2.3 Carolina Yachts builds custom yachts in its production factory in South Carolina. Once complete, these yachts must be shipped to the dealership. They have collected this shipping cost data:

Month	Yachts Shipped	Shipping Cost
January	6	$11,650
February	4	9,100
March	3	7,825
April	8	14,200
May	2	6,550
June	7	12,925
July	5	10,375

A. Prepare a scatter graph of the shipping data. Plot cost on the vertical axis and yachts shipped on the horizontal axis. Is the relationship between shipping costs and unit shipped approximately linear? Draw a straight line through the scatter graph.
B. Using the high-low method, create the cost formula for Carolina Yachts' shipping costs.
C. The least-squares regression method was used and the analysis resulted in this cost equation: $Y = 4{,}000 + 1{,}275x$. Comment on the accuracy of your high-low method estimation.
D. What would you estimate shipping costs to be if Carolina Yachts shipped 10 yachts in a single month? Use the cost formula you obtained in part B. Comment on how accurately this is reflected by the scatter graph you constructed.
E. What factors other than number of yachts shipped do you think could affect Carolina Yachts' shipping expense? Explain.

Problem Set B

PB1. LO 2.1 Hicks Products produces and sells patio furniture through a national dealership network. They purchase raw materials from a variety of suppliers and all manufacturing, and assembly work is performed at their plant outside of Cleveland, Ohio. They recorded these costs for the year ending December 31, 2017. Construct an income statement for Hicks Products, to reflect their net income for 2017.

Sales revenue	$3,100,000
Straight-line depreciation on office equipment	90,000
Advertising and marketing expense	625,000
Administrative salaries	136,000
Cost of goods sold	1,700,000
Rent on corporate headquarters	65,000

PB2. LO 2.1 Conner & Scheer, Attorneys at Law, provide a wide range of legal services for their clients. They employ several paralegal and administrative support staff in order to provide high-quality legal services at competitive prices. For the year ending December 31, 2017, the firm reported these income and expenses. Using this information, construct an income statement to reflect the firm's net income for 2017.

Service revenue	$2,250,000
Paralegal salaries	215,000
Supplies and materials	42,000
Utilities	26,000
Office rent	58,000
Administrative expenses	195,000
Attorney salaries	925,000

PB3. LO 2.1 Puzzles, Pranks & Games is a retail business selling children's toys and games as well as a wide selection of jigsaw puzzles and accessories. They purchase their inventory from local and national wholesale suppliers. For the year ending December 31, 2017, they reported these revenues and expenses. Using this information, prepare an income statement for Puzzles, Pranks & Games for 2017.

Sales revenue	$415,000
Rent	24,000
Advertising	13,000
Sales staff salaries	45,000
Cost of goods sold	210,000
Utilities	11,000
Supplies	4,000

PB4. LO 2.2 Pocket Umbrella, Inc, is considering producing a new type of umbrella. This new pocket-sized umbrella would fit into a coat pocket or purse. Classify the following costs of this new product as direct materials, direct labor, manufacturing overhead, or selling and administrative.[6]

A. Cost of advertising the product
B. Fabric used to make the umbrellas
C. Maintenance of cutting machines used to cut the umbrella fabric so it will fit the umbrella frame
D. Wages of workers who assemble the product
E. President's salary
F. The salary of the supervisor of the people who assemble the product
G. Wages of the product tester who stands in a shower to make sure the umbrellas do not leak
H. Cost of market research survey
I. Salary of the company's sales managers
J. Depreciation of administrative office building

PB5. Using the costs listed in the previous problem, classify the costs as either product costs or period costs.

PB6. LO 2.3 Gadell Farms produces venison sausage that is distributed to grocery stores throughout the Southeast. They have collected this shipping cost data:

Month	Tons Produced	Packaging Cost
January	6	$1,700
February	4	2,000
March	3	2,100
April	8	2,700
May	2	1,602
June	7	1,900
July	5	2,300

A. Prepare a scatter graph of the shipping data. Plot cost on the vertical axis and tons produced on the horizontal axis. Is the relationship between packaging costs and tons produced approximately linear? Draw a straight line through the scatter graph.
B. Using the high-low method, estimate the cost formula for Gadell Farms' packaging costs.
C. The least-squares regression method was used and the analysis resulted in this cost equation: $Y = 1650 + 78.57x$. Comment on the accuracy of your high-low method estimation.
D. What would you estimate packaging costs to be if Gadell Farms shipped 10 tons in a single month? Use the cost formula you obtained in part B. Comment on how accurately this is reflected by the scatter graph you constructed.
E. What factors other than number of tons produced do you think could affect Gadell Farm's packaging expense? Explain.

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Thought Provokers

TP1. LO 2.1 In a team of two or three students, interview the manager/owner of a local business. In this interview, ask the manager/owner the following questions:

A. Does the business collect and use cost information to make decisions?
B. Does it have a specialist in cost estimation who works with this cost data? If not, who is responsible for the collection of cost information? Be as specific as possible.
C. What type of cost information does the business collect and how is each type of information used?
D. How important does the owner/manager believe cost information is to the success of the business?

Then, write a report to the instructor summarizing the results of the interview.

Content of the memo must include

- date of the interview,
- the name and title of the person interviewed,
- name and location of the business,
- type of business (service, merchandising, manufacturing) and brief description of the goods/services provided by the business, and
- responses to questions A–D.

TP2. LO 2.2 This list contains costs that various organizations incur; they fall into three categories: direct materials (DM), direct labor (DL), or overhead (OH).[7]

A. Classify each of these items as direct materials, direct labor, or overhead.
    i. Glue used to attach labels to bottles containing a patented medicine.
    ii. Compressed air used in operating paint sprayers for Student Painters, a company that paints houses and apartments.
    iii. Insurance on a factory building and equipment.
    iv. A production department supervisor's salary.
    v. Rent on factory machinery.
    vi. Iron ore in a steel mill.
    vii. Oil, gasoline, and grease for forklift trucks in a manufacturing company's warehouse.
    viii. Services of painters in building construction.
    ix. Cutting oils used in machining operations.
    x. Cost of paper towels in a factory employees' washroom.
    xi. Payroll taxes and fringe benefits related to direct labor.
    xii. The plant electricians' salaries.
    xiii. Crude oil to an oil refinery.
    xiv. Copy editor's salary in a book publishing company.
B. Assume your classifications could be challenged in a court case. Indicate to your attorneys which of your answers for part a might be successfully disputed by the opposing attorneys and why. In which answers are you completely confident?

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3

Cost-Volume-Profit Analysis

Figure 3.1 Balancing Cost, Volume, and Profit. Managers employ cost-volume-profit (CVP) analysis to determine the sales level at which they break even or balance their revenue with their expenses. (credit: modification of "Balance Swing Equality" by "Mediamodifier"/Pixabay, CC0)

Chapter Outline

LO **3.1** Explain Contribution Margin and Calculate Contribution Margin per Unit, Contribution Margin Ratio, and Total Contribution Margin

LO **3.2** Calculate a Break-Even Point in Units and Dollars

LO **3.3** Perform Break-Even Sensitivity Analysis for a Single Product Under Changing Business Situations

LO **3.4** Perform Break-Even Sensitivity Analysis for a Multi-Product Environment Under Changing Business Situations

LO **3.5** Calculate and Interpret a Company's Margin of Safety and Operating Leverage

Why It Matters

As president of the Accounting Club, you are working on a fundraiser selling T-shirts on campus. You have gotten quotes from several suppliers ranging from $8 to $10 per shirt and now have to select a vendor. The prices vary based on whether the T-shirts have pockets, have long sleeves or short sleeves, and are printed on one side or both. You are confident that you can sell them for $15 each. However, the college charges clubs a $100 "student sale" fee, and your T-shirt sales must cover this cost and still net the club enough money to pay for your spring trip

In addition, several of the vendors will give volume discounts—the more shirts you purchase, the less each shirt costs. In short, you need to know exactly which style of T-shirt, vendor, and quantity will allow you to reach your desired net income and cover your fixed expense of $100. You decide on a short-sleeve shirt with a pocket that costs $10 each and that you can sell for $15.

This $5 per shirt "gross profit" will first go toward covering the $100 student sale fee. That means you will have to sell 20 shirts to pay the fee ($100/$5 = 20 shirts). After selling the first 20 shirts, the $5 profit will be available to start paying for the cost of the trip. Your faculty advisor has calculated that the trip will cost $125 per student, and you have 6 people signed up for the trip. This means the sale will need to generate an additional $750 from the sale (6 students × $125). At $5 per shirt you will need to sell 150 shirts to cover the student costs ($750/$5). So, you will need to sell a total of 170 shirts: 20 to cover your fixed cost of $100 and an additional 150 to cover the student's cost of the trip ($750). What you have just completed is a cost-volume-profit analysis. In this chapter, we will explore how managers can use this type of analysis to make a wide range of decisions about their business operations.

3.1 Explain Contribution Margin and Calculate Contribution Margin per Unit, Contribution Margin Ratio, and Total Contribution Margin

Before examining contribution margins, let's review some key concepts: fixed costs, relevant range, variable costs, and contribution margin. Fixed costs are those costs that will not change within a given range of production. For example, in the current case, the fixed costs will be the student sales fee of $100. No matter how many shirts the club produces within the relevant range, the fee will be locked in at $100. The **relevant range** is the anticipated production activity level. Fixed costs remain constant within a relevant range. If production levels exceed expectations, then additional fixed costs will be required.

For example, assume that the students are going to lease vans from their university's motor pool to drive to their conference. A university van will hold eight passengers, at a cost of $200 per van. If they send one to eight participants, the fixed cost for the van would be $200. If they send nine to sixteen students, the fixed cost would be $400 because they will need two vans. We would consider the relevant range to be between one and eight passengers, and the fixed cost in this range would be $200. If they exceed the initial relevant range, the fixed costs would increase to $400 for nine to sixteen passengers.

Variable costs are those costs that vary per unit of production. Direct materials are often typical variable costs, because you normally use more direct materials when you produce more items. In our example, if the students sold 100 shirts, assuming an individual variable cost per shirt of $10, the total variable costs would be $1,000 (100 × $10). If they sold 250 shirts, again assuming an individual variable cost per shirt of $10, then the total variable costs would $2,500 (250 × $10).

Contribution margin is the amount by which a product's selling price exceeds its total variable cost per unit. This difference between the sales price and the per unit variable cost is called the contribution margin because it is the per unit contribution toward covering the fixed costs. It typically is calculated by comparing the sales revenue generated by the sale of one item versus the variable cost of the item:

$$\text{Contribution Margin} = \text{Sales} - \text{Variable Costs}$$

In our example, the sales revenue from one shirt is $15 and the variable cost of one shirt is $10, so the individual contribution margin is $5. This $5 contribution margin is assumed to first cover fixed costs first and then realized as profit.

As you will see, it is not just small operations, such as the accounting club scenario provided in Why It Matters, that benefit from cost-volume-profit (CVP) analysis. At some point, all businesses find themselves asking the same basic questions: How many units must be sold in order to reach a desired income level? How much will each unit cost? How much of the sales price from each unit will help cover our fixed costs? For example, Starbucks faces these same questions every day, only on a larger scale. When they introduce new menu items, such as seasonal specialty drinks, they must determine the fixed and variable costs associated with each item.

Adding menu items may not only increase their fixed costs in the short run (via advertising and promotions) but will bring new variable costs. Starbucks needs to price these drinks in a way that covers the variable costs per unit and additional fixed costs and contributes to overall net income. Regardless of how large or small the enterprise, understanding how fixed costs, variable costs, and volume are related to income is vital for sound decision-making.

Figure 3.2 Starbucks. Large corporations like Starbucks use cost-volume-profit analysis to make decisions about their products and services to ensure that they are maximizing their revenues. (credit: modification of "StarbucksVaughanMills" by "Raysonho"/Wikimedia Commons, CC0)

Understanding how to use fixed costs, variable costs, and sales in CVP analyses requires an understanding of the term margin. You may have heard that restaurants and grocery stores have very low margins, while jewelry stores and furniture stores have very high margins. What does "margin" mean? In the broadest terms, margin is the difference between a product or service's selling price and its cost of production. Recall the accounting club's T-shirt sale. The difference between the sales price per T-shirt and the purchase price of the T-shirts was the accounting club's margin:

Sales Price	$15
Cost per T-shirt	10
Margin	$ 5

Recall that Building Blocks of Managerial Accounting explained the characteristics of fixed and variable costs and introduced the basics of cost behavior. Let's now apply these behaviors to the concept of contribution margin. The company will use this "margin" to cover fixed expenses and hopefully to provide a profit. Let's begin by examining contribution margin on a per unit basis.

Unit Contribution Margin

When the contribution margin is calculated on a per unit basis, it is referred to as the contribution margin per unit or unit contribution margin. You can find the contribution margin per unit using the equation shown in image.

Per Unit Sales Price – Variable Cost per Unit = Contribution Margin per Unit

It is important to note that this unit contribution margin can be calculated either in dollars or as a percentage.

To demonstrate this principle, let's consider the costs and revenues of Hicks Manufacturing, a small company that manufactures and sells birdbaths to specialty retailers.

Hicks Manufacturing sells its Blue Jay Model for $1100 and incurs variable costs of $20 per unit. In order to calculate their per unit contribution margin, we use the formula in image to determine that on a *per unit* basis, their contribution margin is:

HICKS MANUFACTURING Blue Jay Model For Year Ended December 31, 2019	
Sales Price per Unit	$100
– Variable Cost per Unit	20
= Contribution Margin per Unit	$ 80

This means that for every Blue Jay model they sell, they will have $80 to *contribute* toward covering fixed costs, such as rent, insurance, and manager salaries. But Hicks Manufacturing manufactures and sells more than one model of birdbath. They also sell a Cardinal Model for $75, and these birdbaths incur variable costs of $15 per unit. For the Cardinal Model, their contribution margin on a per unit basis is the $75 sales price less the $15 per unit variable costs is as follows:

HICKS MANUFACTURING Cardinal Model For Year Ended December 31, 2019	
Sales Price per Unit	$75
– Variable Cost per Unit	15
= Contribution Margin per Unit	$60

This demonstrates that, for every Cardinal model they sell, they will have $60 to *contribute* toward covering fixed costs and, if there is any left, toward profit. Every product that a company manufactures or every service a company provides will have a unique contribution margin per unit. In these examples, the contribution margin per unit was calculated in dollars per unit, but another way to calculate contribution margin is as a ratio (percentage).

Contribution Margin Ratio

The **contribution margin ratio** is the percentage of a unit's selling price that exceeds total unit variable costs. In other words, contribution margin is expressed as a percentage of sales price and is calculated using this formula:

$$\text{Contribution Margin Ratio} = \frac{\text{Contribution Margin per Unit}}{\text{Sales Price per Unit}}$$

For Hicks Manufacturing and their Blue Jay Model, the contribution margin ratio will be

$$\frac{\$80 \text{ Contribution Margin per Unit}}{\$100 \text{ Sales Price per Unit}} = 0.80$$

At a contribution margin ratio of 80%, approximately $0.80 of each sales dollar generated by the sale of a Blue Jay Model is available to cover fixed expenses and contribute to profit. The contribution margin ratio for the birdbath implies that, for every $1 generated by the sale of a Blue Jay Model, they have $0.80 that contributes

to fixed costs and profit. Thus, 20% of each sales dollar represents the variable cost of the item and 80% of the sales dollar is margin. Just as each product or service has its own contribution margin on a per unit basis, each has a unique contribution margin ratio. Although this process is extremely useful for analyzing the profitability of a single product, good, or service, managers also need to see the "big picture" and will examine contribution margin in total across all products, goods, or services.

YOUR TURN

Margin at the Kiosk

You rent a kiosk in the mall for $300 a month and use it to sell T-shirts with college logos from colleges and universities all over the world. You sell each T-shirt for $25, and your cost for each shirt is $15. You also pay your sales person a commission of $0.50 per T-shirt sold in addition to a salary of $400 per month. Construct a contribution margin income statement for two different months: in one month, assume 100 T-shirts are sold, and in the other, assume 200 T-shirts are sold.

Solution

Pertinent information		Contribution margin income statement 100 units sold		Contribution margin income statement 200 units sold	
Sales price per unit	$ 25	Sales revenue	$2,500	Sales revenue	$5,000
Variable costs:		Variable costs per unit ($15 + 0.50) x 100 units	1,550	Variable costs per unit ($15 + 0.50) x 200 units	3,100
Per shirt cost	15	Contribution margin	950	Contribution margin	1,900
Per shirt commission	0.50	Fixed costs	700	Fixed costs	700
Fixed costs:		Net operating income	$ 250	Net operating income	$1,200
Kiosk rental	300				
Salary	400				

Total Contribution Margin

This "big picture" is gained by calculating **total contribution margin**—the total amount by which total sales exceed total variable costs. We calculate total contribution margin by multiplying per unit contribution margin by sales volume or number of units sold. This approach allows managers to determine how much profit a company is making before paying its fixed expenses. For Hicks Manufacturing, if the managers want to determine how much their Blue Jay Model contributes to the overall profitability of the company, they can calculate total contribution margin as follows:

HICKS MANUFACTURING Blue Jay Model For Month Ended April, 2019	
Units Sold	450
Contribution Margin per Unit	×$ 80
Total Contribution Margin	$36,000

For the month of April, sales from the Blue Jay Model contributed $36,000 toward fixed costs. Looking at

contribution margin in total allows managers to evaluate whether a particular product is profitable and how the sales revenue from that product contributes to the overall profitability of the company. In fact, we can create a specialized income statement called a contribution margin income statement to determine how changes in sales volume impact the bottom line.

To illustrate how this form of income statement can be used, contribution margin income statements for Hicks Manufacturing are shown for the months of April and May.

In April, Hicks sold 500 Blue Jay Models at $100 per unit, which resulted in the operating income shown on the contribution margin income statement:

HICKS MANUFACTURING Contribution Margin Income Statement For Month Ended April, 2019	
Sales (500 units at $100 per unit)	$50,000
Variable Cost (500 units at $20 per unit)	10,000
Contribution Margin	40,000
Fixed Costs	23,000
Operating Income	$17,000

In May, 750 of the Blue Jay models were sold as shown on the contribution margin income statement. When comparing the two statements, take note of what changed and what remained the same from April to May.

HICKS MANUFACTURING Contribution Margin Income Statement For Month Ended May, 2019	
Sales (750 units at $100 per unit)	$75,000
Variable Cost (750 units at $20 per unit)	15,000
Contribution Margin	60,000
Fixed Costs	23,000
Operating Income	$37,000

Using this contribution margin format makes it easy to see the impact of changing sales volume on operating income. Fixed costs remained unchanged; however, as more units are produced and sold, more of the per-unit sales price is available to contribute to the company's net income.

Before going further, let's note several key points about CVP and the contribution margin income statement. First, the contribution margin income statement is used for *internal* purposes and is not shared with external stakeholders. Secondly, in this specialized income statement, when "*operating* income" is shown, it actually refers to "net operating income" *without regard to income taxes*. Companies can also consider taxes when performing a CVP analysis to project both net operating income and net income. (The preparation of contribution margin income statements with regard to taxes is covered in advanced accounting courses; here, we will consider net income as net operating income without regard to taxes.)

Regardless of whether contribution margin is calculated on a per-unit basis, calculated as a ratio, or incorporated into an income statement, all three express how much sales revenue is available to cover fixed expenses and contribute to profit. Let's examine how all three approaches convey the same financial performance, although represented somewhat differently.

You will recall that the per-unit contribution margin was $80 for a Hicks Blue Jay birdbath. When Hicks sold 500 units, each unit contributed $80 to fixed expenses and profit, which can be verified from April's income statement:

April Total Contribution Margin	$40,000
Per Unit Contribution Margin	$ 80

$$\frac{\text{Total Contribution Margin}}{\text{Per Unit Contribution Margin}} = \text{Number of Units Sold} = \frac{\$40{,}000}{80} = 500 \text{ units}$$

Now, let's use May's Contribution Margin Income Statement as previously calculated to verify the contribution margin based on the contribution margin ratio previously calculated, which was 80%, by applying this formula:

Total Sales × Contribution Margin Ratio = Total Contribution Margin

May Total Sales	$75,000
Contribution Margin Ratio	80%

$75,000 × 0.80 = $60,000

Regardless of how contribution margin is expressed, it provides critical information for managers. Understanding how each product, good, or service contributes to the organization's profitability allows managers to make decisions such as which product lines they should expand or which might be discontinued. When allocating scarce resources, the contribution margin will help them focus on those products or services with the highest margin, thereby maximizing profits.

The Evolution of Cost-Volume-Profit Relationships

The CVP relationships of many organizations have become more complex recently because many labor-intensive jobs have been replaced by or supplemented with technology, changing both fixed and variable costs. For those organizations that are still labor-intensive, the labor costs tend to be variable costs, since at higher levels of activity there will be a demand for more labor usage. For example, assuming one worker is needed for every 50 customers per hour, we might need two workers for an average sales season, but during the Thanksgiving and Christmas season, the store might experience 250 customers per hour and thus would need five workers.

However, the growing trend in many segments of the economy is to convert labor-intensive enterprises (primarily variable costs) to operations heavily dependent on equipment or technology (primarily fixed costs). For example, in retail, many functions that were previously performed by people are now performed by machines or software, such as the self-checkout counters in stores such as Walmart, Costco, and Lowe's. Since machine and software costs are often depreciated or amortized, these costs tend to be the same or fixed, no matter the level of activity within a given relevant range.

In China, completely unmanned grocery stores have been created that use facial recognition for accessing the store. Patrons will shop, bag the purchased items, leave the store, and be billed based on what they put in their bags. Along with managing the purchasing process, inventory is maintained by sensors that let managers know when they need to restock an item.

In the United States, similar labor-saving processes have been developed, such as the ability to order groceries or fast food online and have it ready when the customer arrives. Another major innovation affecting labor costs is the development of driverless cars and trucks (primarily fixed costs), which will have a major impact on the number of taxi and truck drivers in the future (primarily variable costs). Do these labor-saving processes

change the cost structure for the company? Are variable costs decreased? What about fixed costs? Let's look at this in more detail.

When ordering food through an app, there is no need to have an employee take the order, but someone still needs to prepare the food and package it for the customer. The variable costs associated with the wages of order takers will likely decrease, but the fixed costs associated with additional technology to allow for online ordering will likely increase. When grocery customers place their orders online, this not only requires increased fixed costs for the new technology, but it can also increase variable labor costs, as employees are needed to fill customers' online orders. Many stores may move cashier positions to online order fulfillment rather than hiring additional employees. Other stores may have employees fill online grocery orders during slow or downtimes.

Using driverless cars and trucks decreases the variable costs tied to the wages of the drivers but requires a major investment in fixed-cost assets—the autonomous vehicles—and companies would need to charge prices that allowed them to recoup their expensive investments in the technology as well as make a profit. Alternatively, companies that rely on shipping and delivery companies that use driverless technology may be faced with an increase in transportation or shipping costs (variable costs). These costs may be higher because technology is often more expensive when it is new than it will be in the future, when it is easier and more cost effective to produce and also more accessible. A good example of the change in cost of a new technological innovation over time is the personal computer, which was very expensive when it was first developed but has decreased in cost significantly since that time. The same will likely happen over time with the cost of creating and using driverless transportation.

You might wonder why a company would trade variable costs for fixed costs. One reason might be to meet company goals, such as gaining market share. Other reasons include being a leader in the use of innovation and improving efficiencies. If a company uses the latest technology, such as online ordering and delivery, this may help the company attract a new type of customer or create loyalty with longstanding customers. In addition, although fixed costs are riskier because they exist regardless of the sales level, once those fixed costs are met, profits grow. All of these new trends result in changes in the composition of fixed and variable costs for a company and it is this composition that helps determine a company's profit.

As you will learn in future chapters, in order for businesses to remain profitable, it is important for managers to understand how to measure and manage fixed and variable costs for decision-making. In this chapter, we begin examining the relationship among sales volume, fixed costs, variable costs, and profit in decision-making. We will discuss how to use the concepts of fixed and variable costs and their relationship to profit to determine the sales needed to break even or to reach a desired profit. You will also learn how to plan for changes in selling price or costs, whether a single product, multiple products, or services are involved.

THINK IT THROUGH

Deciding Between Orders

You are evaluating orders from two new customers, but you will only be able to accept one of the orders without increasing your fixed costs. Management has directed you to choose the one that is most profitable for the company. Customer A is ordering 500 units and is willing to pay $200 per unit, and these units have a contribution margin of $60 per unit. Customer B is ordering 1,000 units and is willing

to pay $140 per unit, and these units have a contribution margin ratio of 40%. Which order do you select and why?

LINK TO LEARNING

Watch this video from Investopedia reviewing the concept of contribution margin (https://openstax.org/l/50ContMargin) to learn more. Keep in mind that contribution margin per sale first contributes to meeting fixed costs and then to profit.

3.2 Calculate a Break-Even Point in Units and Dollars

In Building Blocks of Managerial Accounting, you learned how to determine and recognize the fixed and variable components of costs, and now you have learned about contribution margin. Those concepts can be used together to conduct cost-volume-profit (CVP) analysis, which is a method used by companies to determine what will occur financially if selling prices change, costs (either fixed or variable) change, or sales/production volume changes.

It is important, first, to make several assumptions about operations in order to understand CVP analysis and the associated contribution margin income statement. However, while the following assumptions are typical in CVP analysis, there can be exceptions. For example, while we typically assume that the sales price will remain the same, there might be exceptions where a quantity discount might be allowed. Our CVP analysis will be based on these assumptions:

- Costs are linear and can clearly be designated as either fixed or variable. In other words, fixed costs remain fixed in total over the relevant range and variable costs remain fixed on a per-unit basis. For example, if a company has the capability of producing up to 1,000 units a month of a product given its current resources, the relevant range would be 0 to 1,000. If they decided that they wanted to produce 1,800 units a month, they would have to secure additional production capacity. While they might be able to add an extra production shift and then produce 1,800 units a month without buying an additional machine that would increase production capacity to 2,000 units a month, companies often have to buy additional production equipment to increase their relevant range. In this example, the production capacity between 1,800 and 2,000 would be an expense that currently would not provide additional contribution toward fixed costs.
- Selling price per unit remains constant and does not increase or decrease based on volume (i.e., customers are not given discounts based on quantity purchased).
- In the case of manufacturing businesses, inventory does not change because we make the assumption that all units produced are sold.
- In the case of a company that sells multiple products, the sales mix remains constant. For example, if we are a beverage supplier, we might assume that our beverage sales are 3 units of coffee pods and two units of tea bags.

Using these assumptions, we can begin our discussion of CVP analysis with the break-even point.

Basics of the Break-Even Point

The **break-even point** is the dollar amount (total sales dollars) or production level (total units produced) at which the company has recovered all variable and fixed costs. In other words, no profit or loss occurs at break-even because Total Cost = Total Revenue. Figure 3.3 illustrates the components of the break-even point:

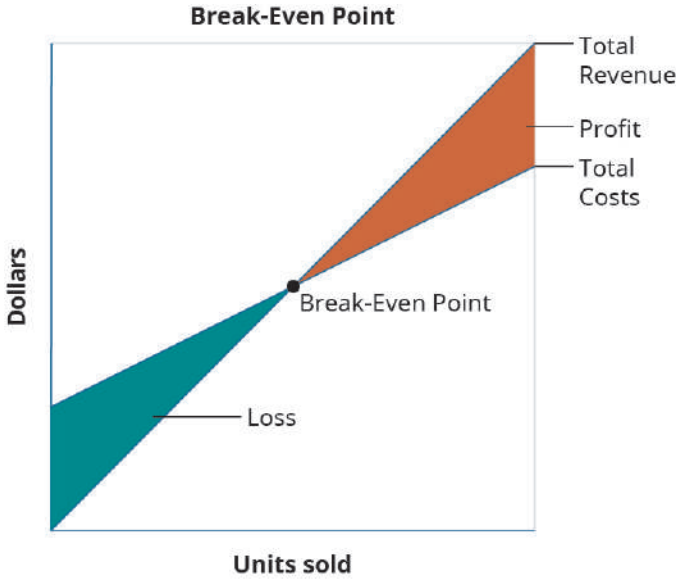

Figure 3.3 Break-Even Point. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

The basic theory illustrated in Figure 3.3 is that, because of the existence of fixed costs in most production processes, in the first stages of production and subsequent sale of the products, the company will realize a loss. For example, assume that in an extreme case the company has fixed costs of $20,000, a sales price of $400 per unit and variable costs of $250 per unit, and it sells no units. It would realize a loss of $20,000 (the fixed costs) since it recognized no revenue or variable costs. This loss explains why the company's cost graph recognized costs (in this example, $20,000) even though there were no sales. If it subsequently sells units, the loss would be reduced by $150 (the contribution margin) for each unit sold. This relationship will be continued until we reach the break-even point, where total revenue equals total costs. Once we reach the break-even point for each unit sold the company will realize an increase in profits of $150.

For each additional unit sold, the loss typically is lessened until it reaches the break-even point. At this stage, the company is theoretically realizing neither a profit nor a loss. After the next sale beyond the break-even point, the company will begin to make a profit, and the profit will continue to increase as more units are sold. While there are exceptions and complications that could be incorporated, these are the general guidelines for break-even analysis.

As you can imagine, the concept of the break-even point applies to every business endeavor—manufacturing, retail, and service. Because of its universal applicability, it is a critical concept to managers, business owners, and accountants. When a company first starts out, it is important for the owners to know when their sales will be sufficient to cover all of their fixed costs and begin to generate a profit for the business. Larger companies may look at the break-even point when investing in new machinery, plants, or equipment in order to predict how long it will take for their sales volume to cover new or additional fixed costs. Since the break-even point

represents that point where the company is neither losing nor making money, managers need to make decisions that will help the company reach and *exceed* this point as quickly as possible. No business can operate for very long below break-even. Eventually the company will suffer losses so great that they are forced to close their doors.

ETHICAL CONSIDERATIONS

Break-Even Analysis and Profitability

The first step in determining the viability of the business decision to sell a product or provide a service is analyzing the true cost of the product or service and the timeline of payment for the product or service. Ethical managers need an estimate of a product or service's cost and related revenue streams to evaluate the chance of reaching the break-even point.

Determining an accurate price for a product or service requires a detailed analysis of both the cost and how the cost changes as the volume increases. This analysis includes the timing of both costs and receipts for payment, as well as how these costs will be financed. An example is an IT service contract for a corporation where the costs will be frontloaded. When costs or activities are frontloaded, a greater proportion of the costs or activities occur in an earlier stage of the project. An IT service contract is typically employee cost intensive and requires an estimate of at least 120 days of employee costs before a payment will be received for the costs incurred. An IT service contract for $100,000 in monthly services with a 30% profit margin will require 4 months of upfront financing of $280,000 balanced over the four months before a single payment is received.

The overall profit at a specific point in time requires a careful determination of all of the costs associated with creating and selling the product or providing the service. An ethical managerial accountant will provide a realistic cost estimate, regardless of management's desire to sell a product or provide a service. What might be a lucrative product on its face needs additional analysis provided by the managerial accountant.

To illustrate the concept of break-even, we will return to Hicks Manufacturing and look at the Blue Jay birdbath they manufacture and sell.

LINK TO LEARNING

Watch this video of an example of performing the first steps of cost-volume-profit analysis (https://openstax.org/l/50CVPanalysis) to learn more.

Sales Where Operating Income Is $0

Hicks Manufacturing is interested in finding out the point at which they break even selling their Blue Jay Model birdbath. They will break even when the operating income is $0. The operating income is determined by

subtracting the total variable and fixed costs from the sales revenue generated by an enterprise. In other words, the managers at Hicks want to know how many Blue Jay birdbaths they will need to sell in order to cover their fixed expenses and break even. Information on this product is:

HICKS MANUFACTURING Blue Jay Model For Year Ended December 31, 2019	
Sales Price per Unit	$ 100
Variable Cost per Unit	20
Contribution Margin per Unit	80
Total Fixed Cost per Month	$18,000

In order to find their break-even point, we will use the contribution margin for the Blue Jay and determine how many contribution margins we need in order to cover the fixed expenses, as shown in the formula in Figure 3.4.

$$\textbf{Break-Even Point in Units:} \frac{\textbf{Total Fixed Costs}}{\textbf{Contribution Margin per Unit}}$$

Figure 3.4 Break-Even Point in Units. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Applying this to Hicks calculates as:

$$\frac{\$18{,}000}{\$80} = 225 \text{ units}$$

What this tells us is that Hicks must sell 225 Blue Jay Model birdbaths in order to cover their fixed expenses. In other words, they will not begin to show a profit until they sell the 226th unit. This is illustrated in their contribution margin income statement.

HICKS MANUFACTURING Contribution Margin Income Statement For Year Ended December 31, 2019	
Sales (225 units at $100 per return)	$22,500
Variable Cost (225 units at $20 per return)	4,500
Contribution Margin	18,000
Fixed Costs	18,000
Operating Income	$ 0

The break-even point for Hicks Manufacturing at a sales volume of $22,500 (225 units) is shown graphically in Figure 3.5.

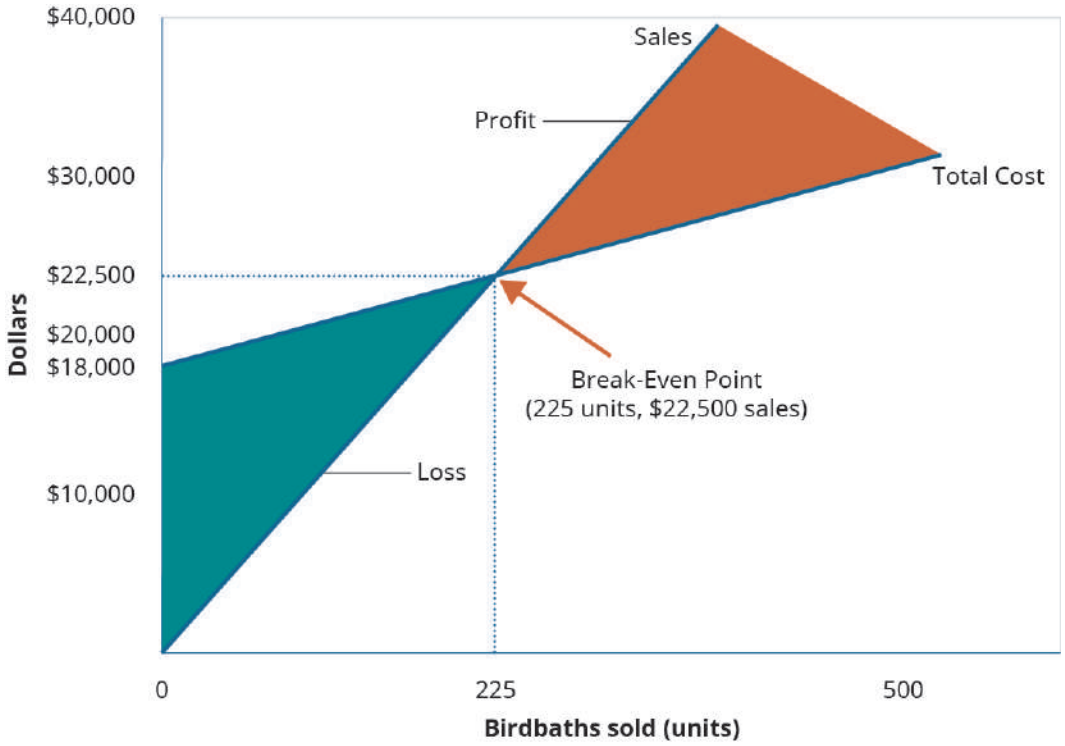

Figure 3.5 Hicks Manufacturing Break-Even Point for 225 Units. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

As you can see, when Hicks sells 225 Blue Jay Model birdbaths, they will make no profit, but will not suffer a loss because all of their fixed expenses are covered. However, what happens when they do not sell 225 units? If that happens, their operating income is negative.

Sales Where Operating Income Is Negative

In a recent month, local flooding caused Hicks to close for several days, reducing the number of units they could ship and sell from 225 units to 175 units. The information in Figure 3.6 reflects this drop in sales.

HICKS MANUFACTURING Contribution Margin Income Statement For Year Ended December 31, 2019	
Sales (175 units at $100 per unit)	$17,500
Variable Cost (175 units at $20 per unit)	3,500
Contribution Margin	14,000
Fixed Costs	18,000
Operating Income	$ (4,000)

Figure 3.6 Hicks Manufacturing Contribution Margin Income Statement. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

At 175 units ($17,500 in sales), Hicks does not generate enough sales revenue to cover their fixed expenses and they suffer a loss of $4,000. They did not reach the break-even point of 225 units.

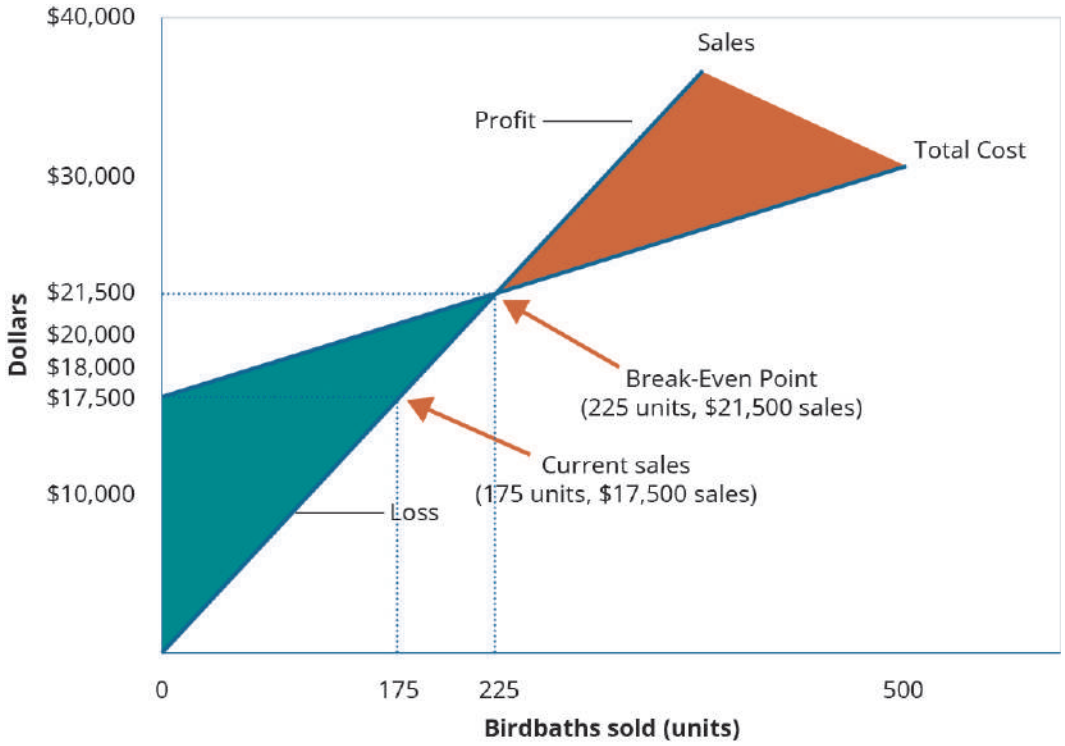

Figure 3.7 Hicks Manufacturing Break-Even Point for 175 Units. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Sales Where Operating Income Is Positive

What happens when Hicks has a busy month and sells 300 Blue Jay birdbaths? We have already established that the contribution margin from 225 units will put them at break-even. When sales exceed the break-even point the unit contribution margin from the additional units will go toward profit. This is reflected on their income statement.

HICKS MANUFACTURING Contribution Margin Income Statement For Year Ended December 31, 2019	
Sales (300 units at $100 per unit)	$30,000
Variable Cost (300 units at $20 per unit)	6,000
Contribution Margin	24,000
Fixed Costs	18,000
Operating Income	$ 6,000

Again, looking at the graph for break-even (Figure 3.8), you will see that their sales have moved them beyond the point where total revenue is equal to total cost and into the profit area of the graph.

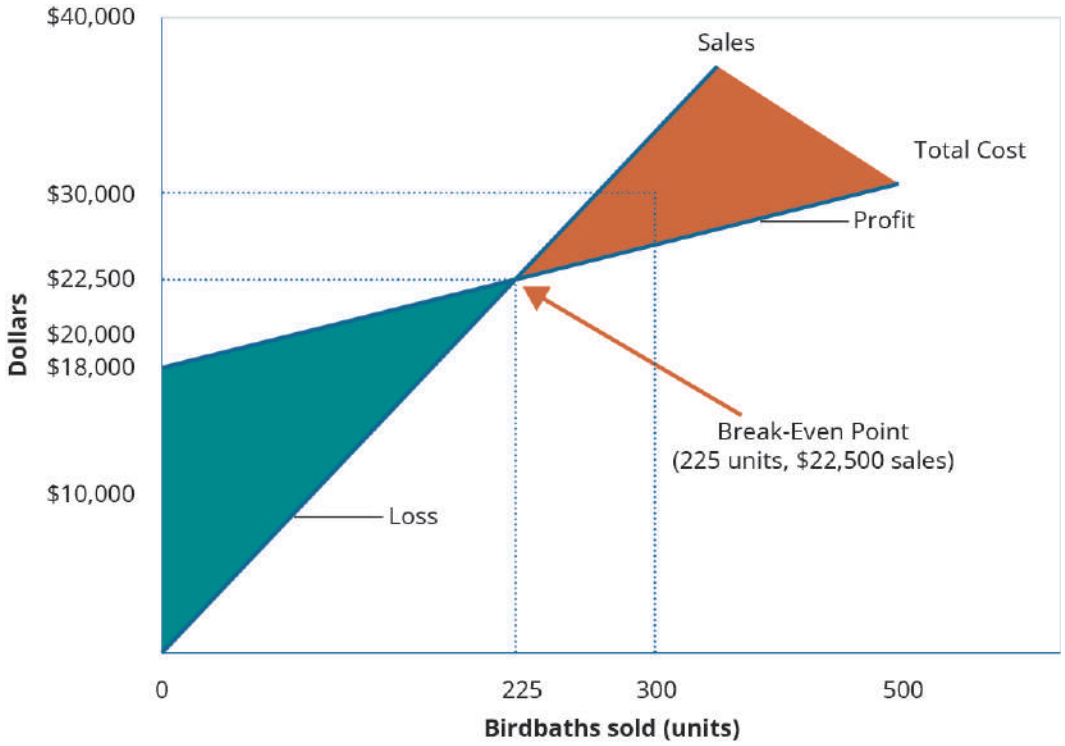

Figure 3.8 Hicks Manufacturing Break-Even Point for 300 Units. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Hicks Manufacturing can use the information from these different scenarios to inform many of their decisions about operations, such as sales goals.

However, using the contribution margin per unit is not the only way to determine a break-even point. Recall that we were able to determine a contribution margin expressed in dollars by finding the contribution margin ratio. We can apply that contribution margin ratio to the break-even analysis to determine the break-even point in dollars. For example, we know that Hicks had $18,000 in fixed costs and a contribution margin ratio of 80% for the Blue Jay model. We will use this ratio (Figure 3.9) to calculate the break-even point in dollars.

$$\textbf{Break-Even Point in Dollars} = \frac{\textbf{Fixed Costs}}{\textbf{Contribution Margin Ratio}}$$

Figure 3.9 Break-Even Point in Dollars. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Applying the formula to Hicks gives this calculation:

$$\frac{\$18{,}000}{0.80} = \$22{,}500$$

Hicks Manufacturing will have to generate $22,500 in monthly sales in order to cover all of their fixed costs. In order for us to verify that Hicks' break-even point is $22,500 (or 225 units) we will look again at the contribution margin income statement at break-even:

HICKS MANUFACTURING Contribution Margin Income Statement For Year Ended December 31, 2019	
Sales (225 units at $100 per unit)	$22,500
Variable Cost (225 units at $20 per unit)	4,500
Contribution Margin	18,000
Fixed Costs	18,000
Operating Income	$ 0

By knowing at what level sales are sufficient to cover fixed expenses is critical, but companies want to be able to make a profit and can use this break-even analysis to help them.

THINK IT THROUGH

The Cost of a Haircut

You are the manager of a hair salon and want to know how many ladies' haircuts your salon needs to sell in a month in order to cover the fixed costs of running the salon. You have determined that, at the current price of $35 per haircut, you have $20 in variable costs associated with each cut. These variable costs include stylist wages, hair product, and shop supplies. Your fixed costs are $3,000 per month. You perform a break-even analysis on a per-unit basis and discover the following:

Sales price per service	$ 35
Variable cost per service	20
Contribution margin per service	15
Break-even (in services)	200

You have 4 stylists plus yourself working in the salon and are open 6 days per week. Considering the break-even point and the number of available stylists, will the salon ever break even? If it does, what will need to happen? What can be done to achieve the break-even point?

Examples of the Effects of Variable and Fixed Costs in Determining the Break-Even Point

Companies typically do not want to simply break even, as they are in business to make a profit. Break-even analysis also can help companies determine the level of sales (in dollars or in units) that is needed to make a desired profit. The process for factoring a desired level of profit into a break-even analysis is to add the desired level of profit to the fixed costs and then calculate a new break-even point. We know that Hicks Manufacturing breaks even at 225 Blue Jay birdbaths, but what if they have a target profit for the month of July? They can simply add that target to their fixed costs. By calculating a target profit, they will produce and (hopefully) sell enough bird baths to cover both fixed costs and the target profit.

If Hicks wants to earn $16,000 in profit in the month of May, we can calculate their new break-even point as follows:

$$\text{Target Profi} = \frac{\text{Fixed costs} + \text{desired profi}}{\text{Contribution margin per unit}} = \frac{\$18{,}000 + \$16{,}000}{\$80} = 425 \text{ units}$$

We have already established that the $18,000 in fixed costs is covered at the 225 units mark, so an additional 200 units will cover the desired profit (200 units × $80 per unit contribution margin = $16,000). Alternatively, we can calculate this in terms of dollars by using the contribution margin ratio.

$$\text{Target Profi} = \frac{\text{Fixed costs} + \text{desired profi}}{\text{Contribution margin ratio}} = \frac{\$18{,}000 + \$16{,}000}{0.80} = \$42{,}500$$

As done previously, we can confirm this calculation using the contribution margin income statement:

Sales (425 units at $100 per unit)	$42,500
Variable Costs (425 units at $20 per unit)	8,500
Contribution Margin	34,000
Fixed Costs	18,000
Operating Income (loss)	$16,000

Note that the example calculations ignored income taxes, which implies we were finding target operating income. However, companies may want to determine what level of sales would generate a desired after-tax profit. To find the break-even point at a desired after-tax profit, we simply need to convert the desired after-tax profit to the desired pre-tax profit, also referred to as operating income, and then follow through as in the example. Suppose Hicks wants to earn $24,000 after-taxes, what level of sales (units and dollars) would be needed to meet that goal? First, the after-tax profit needs to be converted to a pre-tax desired profit:

$$\text{Pre-tax desired profi} = \frac{\text{After-tax profi}}{(1 - \text{tax rate})}$$

If the tax rate for Hicks is 40%, then the $24,000 after-tax profit is equal to a pre-tax profit of $40,000:

$$\$40{,}000 = \frac{\$24{,}000}{(1 - 0.40)}$$

The tax rate indicates the amount of tax expense that will result from any profits and 1 – tax rate indicates the amount remaining after taking out tax expense. The concept is similar to buying an item on sale. If an item costs $80 and is on sale for 40% off, then the amount being paid for the item is 60% of the sale price, or $48 ($80 × 60%). Another way to find this involves two steps. First find the discount ($80 × 40% = $32) and then subtract the discount from the sales price ($80 – $32 = $48).

Taxes and profit work in a similar fashion. If we know the profit before tax is $100,000 and the tax rate is 30%, then tax expenses are $100,000 × 30% = $30,000. This means the after-tax income is $100,000 – $30,000 = $70,000. However, in most break-even situations, as well as other decision-making areas, the desired after-tax profit is known, and the pre-tax profit must be determined by dividing the after-tax profit by 1 – tax rate.

To demonstrate the combination of both a profit and the after-tax effects and subsequent calculations, let's return to the Hicks Manufacturing example. Let's assume that we want to calculate the target volume in units and revenue that Hicks must sell to generate an after-tax return of $24,000, assuming the same fixed costs of $18,000.

Since we earlier determined $24,000 after-tax equals $40,000 before-tax if the tax rate is 40%, we simply use the break-even at a desired profit formula to determine the target sales.

$$\text{Target sales} = \frac{(\text{Fixed costs} + \text{Desired profi})}{\text{Contribution margin per unit}} = \frac{(\$18{,}000 + \$40{,}000)}{\$80} = 725 \text{ units}$$

This calculation demonstrates that Hicks would need to sell 725 units at $100 a unit to generate $72,500 in

sales to earn $24,000 in after-tax profits.

Alternatively, target sales in sales dollars could have been calculated using the contribution margin ratio:

$$\text{Target sales} = \frac{(\text{Fixed costs} + \text{Desired profi})}{\text{Contribution margin per unit}} = \frac{(\$18{,}000 + \$40{,}000)}{0.80} = \$72{,}500$$

Once again, the contribution margin income statement proves the sales and profit relationships.

Sales (725 units x $100 per unit)	$ 72,500
Variable costs (725 units x $20 per unit)	(14,500)
Contribution margin	$ 58,000
Fixed costs	(18,000)
Pre-tax profit	$ 40,000
Income tax expense (40%)	(16,000)
After-tax profit	$ 24,000

Thus, to calculate break-even point at a particular after-tax income, the only additional step is to convert after-tax income to pre-tax income prior to utilizing the break-even formula. It is good to understand the impact of taxes on break-even analysis as companies will often want to plan based on the after-tax effects of a decision as the after-tax portion of income is the only part of income that will be available for future use.

Application of Break-Even Concepts for a Service Organization

Because break-even analysis is applicable to any business enterprise, we can apply these same principles to a service organization. For example, Marshall & Hirito is a mid-sized accounting firm that provides a wide range of accounting services to its clients but relies heavily on personal income tax preparation for much of its revenue. They have analyzed the cost to the firm associated with preparing these returns. They have determined the following cost structure for the preparation of a standard 1040A Individual Income Tax Return:

Charge to Client (sales price per return)	$400
Variable Cost per Return	150

They have fixed costs of $14,000 per month associated with the salaries of the accountants who are responsible for preparing the *Form 1040A*. In order to determine their break-even point, they first determine the contribution margin for the *Form 1040A* as shown:

Sales Price per Return	$400
Variable Cost per Return	150
Contribution Margin per Return	250

Now they can calculate their break-even point:

$$\text{Break-Even Point in Units} = \frac{\text{Total fi ed costs}}{\text{Contribution margin per unit}} = \frac{\$14{,}000}{\$250} = 56 \text{ returns}$$

Remember, this is the break-even point in units (the number of tax returns) but they can also find a break-even point expressed in dollars by using the contribution margin ratio. First, they find the contribution margin ratio. Then, they use the ratio to calculate the break-even point in dollars:

$$\text{Break-Even Point in Dollars} = \frac{\text{Fixed costs}}{\text{Contribution margin ratio}} = \frac{\$14{,}000}{0.625} = \$22{,}400$$

We can confirm these figures by preparing a contribution margin income statement:

MARSHALL & SON, CPAs Contribution Margin Income Statement For Year Ended December 31, 2019	
Sales (56 at $400 per return)	$22,400
Variable Costs (56 at $150 per return)	8,400
Contribution Margin	14,000
Fixed costs	14,000
Operating Income (loss)	$ 0

Therefore, as long as Marshall & Hirito prepares 56 *Form 1040* income tax returns, they will earn no profit but also incur no loss. What if Marshall & Hirito has a target monthly profit of $10,000? They can use the break-even analysis process to determine how many returns they will need to prepare in order to cover their fixed expenses and reach their target profit:

$$\text{Target Profi} = \frac{\text{Fixed costs + desired profi}}{\text{Contribution margin per unit}} = \frac{\$14{,}000 + \$10{,}000}{\$250} = 96 \text{ returns}$$

They will need to prepare 96 returns during the month in order to realize a $10,000 profit. Expressing this in dollars instead of units requires that we use the contribution margin ratio as shown:

$$\text{Target Profi} = \frac{\text{Fixed costs + desired profi}}{\text{Contribution margin per unit}} = \frac{\$14{,}000 + \$10{,}000}{0.625} = \$38{,}400$$

Marshall & Hirito now knows that, in order to cover the fixed costs associated with this service, they must generate $38,400 in revenue. Once again, let's verify this by constructing a contribution margin income statement:

MARSHALL & SON, CPAs Contribution Margin Income Statement For Year Ended December 31, 2019	
Sales (96 at $400 per return)	$38,400
Variable Costs (96 at $150 per return)	14,400
Contribution Margin	24,000
Fixed Costs	14,000
Operating Income (loss)	$10,000

As you can see, the $38,400 in revenue will not only cover the $14,000 in fixed costs, but will supply Marshall & Hirito with the $10,000 in profit (net income) they desire.

As you've learned, break-even can be calculated using either contribution margin per unit or the contribution margin ratio. Now that you have seen this process, let's look at an example of these two concepts presented together to illustrate how either method will provide the same financial results.

Suppose that Channing's Chairs designs, builds, and sells unique ergonomic desk chairs for home and business. Their bestselling chair is the Spine Saver. Figure 3.10 illustrates how Channing could determine the break-even point in sales dollars using either the contribution margin per unit or the contribution margin ratio.

Sales Price per Unit	Cost per Unit	Contribution Margin per Unit	Fixed Costs	Fixed Costs/ Contribution Margin per Unit	Break-Even in Units	Break Even in Dollars
$1,250	$850	$400	$16,800	$16,800/$400	42	42 x $1,250 = $52,500

Contribution Margin per Unit ($1,250 – 850)	Contribution Margin Ratio (CM/Sales or $400 ÷ $1,250)	Break-Even in Sales Dollars (FC ÷ CM or $16,800 ÷ 0.32)	Break-Even in Units (Break Even Sales ÷ Unit Selling Price or $52,500 ÷ $1,250)
$400	32%	$52,500	42 Units

Figure 3.10 Channing's Break-Even Point. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Note that in either scenario, the break-even point is the same in dollars and units, regardless of approach. Thus, you can always find the break-even point (or a desired profit) in units and then convert it to sales by multiplying by the selling price per unit. Alternatively, you can find the break-even point in sales dollars and then find the number of units by dividing by the selling price per unit.

YOUR TURN

College Creations

College Creations, Inc (CC), builds a loft that is easily adaptable to most dorm rooms or apartments and can be assembled into a variety of configurations. Each loft is sold for $500, and the cost to produce one loft is $300, including all parts and labor. CC has fixed costs of $100,000.

A. What happens if CC produces nothing?
B. Now, assume CC produces and sells one unit (loft). What are their financial results?
C. Now, what do you think would happen if they produced and sold 501 units?
D. How many units would CC need to sell in order to break even?
E. How many units would CC need to sell if they wanted to have a pretax profit of $50,000?

Solution

A. If they produce nothing, they will still incur fixed costs of $100,000. They will suffer a net loss of $100,000.

B. If they sell one unit, they will have a net loss of $99,800.

Sales revenue	$ 500
Variable cost per unit	300
Contribution margin	200
Fixed costs	100,000
Operating income (loss)	$ (99,800)

C. If they produce 501 units, they will have operating income of $200 as shown:

Sales revenue (501 units at $500)	$250,500
Variable cost per unit (501 units at $300)	150,300
Contribution margin	100,200
Fixed costs	100,000
Operating income (loss)	$ 200

D. Break-even can be determined by FC/CM per unit: $100,000 ÷ $200 = 500. Five hundred lofts must be sold to break even.

E. The desired profit can be treated like a fixed cost, and the target profit would be (FC + Desired Profit)/CM or ($100,000 + $50,000) ÷ $200 = 750. Seven hundred fifty lofts need to be sold to reach a desired income of $50,000. Another way to have found this is to know that, after fixed costs are met, the $200 per unit contribution margin will go toward profit. The desired profit of $50,000 ÷ $200 per unit contribution margin = 250. This means that 250 additional units must be sold. To break even requires 500 units to be sold, and to reach the desired profit of $50,000 requires an additional 250 units, for a total of 750 units.

3.3 Perform Break-Even Sensitivity Analysis for a Single Product Under Changing Business Situations

Finding the break-even point or the sales necessary to meet a desired profit is very useful to a business, but cost-volume-profit analysis also can be used to conduct a **sensitivity analysis**, which shows what will happen if the sales price, units sold, variable cost per unit, or fixed costs change. Companies use this type of analysis to consider possible scenarios that assist them in planning.

LINK TO LEARNING

Watch this video that shows what happens if one or more of the variables in a break-even analysis is changed (https://openstax.org/l/50BrkEvenChange) to learn more.

The Effects on Break-Even under Changing Business Conditions

Circumstances often change within a company, within an industry, or even within the economy that impact the decision-making of an organization. Sometimes, these effects are sudden and unexpected, for example, if a hurricane destroyed the factory of a company's major supplier; other times, they occur more slowly, such as when union negotiations affect your labor costs. In either of these situations, costs to the company will be affected. Using CVP analysis, the company can predict how these changes will affect profits.

Changing a Single Variable

To demonstrate the effects of changing any one of these variables, consider Back Door Café, a small coffee shop that roasts its own beans to make espresso drinks and gourmet coffee. They also sell a variety of baked

goods and T-shirts with their logo on them. They track their costs carefully and use CVP analysis to make sure that their sales cover their fixed costs and provide a reasonable level of profit for the owners.

Change in Sales Price

The owner of Back Door has one of her employees conduct a survey of the other coffee shops in the area and finds that they are charging $0.75 more for espresso drinks. As a result, the owner wants to determine what would happen to operating income if she increased her price by just $0.50 and sales remained constant, so she performs the following analysis:

Price Change Analysis		
	With Current Price	**With New Price**
Sales Price per Unit	$ 3.75	$ 4.25
Variable Cost per Unit	$ 1.50	$ 1.50
Contribution Margin per Unit	$ 2.25	$ 2.75
Fixed Costs	$2,475	$2,475
Break-even (in units)	1,100	900
Break-Even (in dollars)	$4,125	$3,825
Contribution Margin Income Statement Current Price versus New Price		
Unit Sales, Expected	1,500	1,500
Sales	$5,625	$6,375
Variable Costs	2,250	2,250
Contribution Margin	$3,375	$4,125
Fixed Costs	2,475	2,475
Net Income	$ 900	$1,650

The only variable that has changed is the $0.50 increase in the price of their espresso drinks, but the net operating income will increase by $750. Another way to think of this increase in income is that, if the sales price increases by $0.50 per expresso drink and the estimated sales are 1,500 units, then this will result in an increase in overall contribution margin of $750. Moreover, since all of the fixed costs were met by the lower sales price, all of this $750 goes to profit. Again, this is assuming the higher sales price does not decrease the number of units sold. Since the other coffee shops will still be priced higher than Back Door, the owner believes that there will not be a decrease in sales volume.

When making this adjustment to their sales price, Back Door Café is engaging in **target pricing**, a process in which a company uses market analysis and production information to determine the maximum price customers are willing to pay for a good or service in addition to the markup percentage. If the good can be produced at a cost that allows both the desired profit percentage as well as deliver the good at a price acceptable to the customer, then the company should proceed with the product; otherwise, the company will not achieve its desired profit goals.

Change in Variable Cost

In March, the owner of Back Door receives a letter from her cups supplier informing her that there is a $0.05 price increase due to higher material prices. Assume that the example uses the original $3.75 per unit sales

price. The owner wants to know what would happen to net operating income if she absorbs the cost increase, so she performs the following analysis:

Variable Cost Change Analysis		
	With Current Price	**With Increased Variable Cost**
Sales Price per Unit	$ 3.75	$ 3.75
Variable Cost per Unit	$ 1.50	$ 1.55
Contribution Margin per Unit	$ 2.25	$ 2.20
Fixed Costs	$2,475	$ 2,475
Break-even in Units	1,100	1,125
Break-even in Dollars	$4,125	$4,218.75
Monthly Contribution Margin Income Statement Current Variable Costs versus Increased Variable Costs		
Unit Sales, Expected	1,500	1,500
Sales	$5,625	$ 5,625
Variable Costs	2,250	2,325
Contribution Margin	$3,375	$ 3,300
Fixed Costs	2,475	2,475
Net Income	$ 900	$ 825

She is surprised to see that just a $0.05 increase in variable costs (cups) will reduce her net income by $75. The owner may decide that she is fine with the lower income, but if she wants to maintain her income, she will need to find a new cup supplier, reduce other costs, or pass the price increase on to her customers. Because the increase in the cost of the cups was a variable cost, the impact on net income can be seen by taking the increase in cost per unit, $0.05, and multiplying that by the units expected to be sold, 1,500, to see the impact on the contribution margin, which in this case would be a decrease of $75. This also means a decrease in net income of $75.

Change in Fixed Cost

Back Door Café's lease is coming up for renewal. The owner calls the landlord to indicate that she wants to renew her lease for another 5 years. The landlord is happy to hear she will continue renting from him but informs her that the rent will increase $225 per month. She is not certain that she can afford an additional $225 per month and tells him she needs to look at her numbers and will call him back. She pulls out her CVP spreadsheet and adjusts her monthly fixed costs upwards by $225. Assume that the example uses the original $3.75 per unit sales price. The results of her analysis of the impact of the rent increase on her annual net income are:

Fixed Cost Change Analysis		
	With Current Price	With Increased Fixed Cost
Sales Price per Unit	$ 3.75	$ 3.75
Variable Cost per Unit	$ 1.50	$ 1.50
Contribution Margin per Unit	$ 2.25	$ 2.25
Fixed Costs	$2,475	$2,700
Break-even in Units	1,100	1,200
Break-even in Dollars	$4,125	$4,500
Monthly Contribution Margin Income Statement Current Fixed Costs versus Increased Fixed Costs		
Unit Sales, Expected	1,500	1,500
Sales	$5,625	$5,625
Variable Costs	2,250	2,250
Contribution Margin	$3,375	$3,375
Fixed Costs	2,475	2,700
Net Income	$ 900	$ 675

Because the rent increase is a change in a fixed cost, the contribution margin per unit remains the same. However, the break-even point in both units and dollars increase because more units of contribution are needed to cover the $225 monthly increase in fixed costs. If the owner of the Back Door agrees to the increase in rent for the new lease, she will likely look for ways to increase the contribution margin per unit to offset this increase in fixed costs.

In each of the prior examples, only one variable was changed—sales volume, variable costs, or fixed costs. There are some generalizations that can be made regarding how a change in any one of these variables affects the break-even point. These generalizations are summarized in Table 3.1.

Generalizations Regarding Changes in Break-Even Point from a Change in One Variable

Condition	Result
Sales Price Increases	Break-Even Point Decreases (Contribution Margin is Higher, Need Fewer Sales to Break Even)
Sales Price Decreases	Break-Even Point Increases (Contribution Margin is Lower, Need More Sales to Break Even)
Variable Costs Increase	Break-Even Point Increases (Contribution Margin is Lower, Need More Sales to Break Even)
Variable Costs Decrease	Break-Even Point Decreases (Contribution Margin is Higher, Need Fewer Sales to Break Even)

Table 3.1

Generalizations Regarding Changes in Break-Even Point from a Change in One Variable

Condition	Result
Fixed Costs Increase	Break-Even Point Increases (Contribution Margin Does Not Change, but Need More Sales to Meet Fixed Costs)
Fixed Costs Decrease	Break-Even Point Decreases (Contribution Margin Does Not Change, but Need Fewer Sales to Meet Fixed Costs)

Table 3.1

LINK TO LEARNING

Watch this video that walks through, step by step, how to calculate break even in units and dollars and at a desired profit or sales level (https://openstax.org/l/50BreakEven$) to learn more.

Changing Multiple Variables

We have analyzed situations in which one variable changes, but often, more than one change will occur at a time. For example, a company may need to lower its selling price to compete, but they may also be able to lower certain variable costs by switching suppliers.

Suppose Back Door Café has the opportunity to purchase a new espresso machine that will reduce the amount of coffee beans required for an espresso drink by putting the beans under higher pressure. The new machine will cost $15,000, but it will decrease the variable cost per cup by $0.05. The owner wants to see what the effect will be on the net operating income and break-even point if she purchases the new machine. She has arranged financing for the new machine and the monthly payment will increase her fixed costs by $400 per month. When she conducts this analysis, she gets the following results:

Variable Cost and Fixed Cost Change Analysis		
	With Current Price	With Decreased VC and Increased FC
Sales Price per Unit	$ 3.75	$ 3.75
Variable Cost per Unit	$ 1.50	$ 1.45
Contribution Margin per Unit	$ 2.25	$ 2.30
Fixed Costs	$ 2,475	$ 2,875
Break-even in Units	1,100	1,250
Break-even in Dollars	$4,125.00	$4,687.50

Monthly Contribution Margin Income Statement Current Fixed Costs versus Increased Fixed Costs		
Unit Sales, Expected	1,500	1,500
Sales	$ 5,625	$ 5,625
Variable Costs	2,250	2,175
Contribution Margin	$ 3,375	$ 3,450
Fixed Costs	2,475	2,875
Net Income	$ 900	$ 575

Looking at the "what-if" analysis, we see that the contribution margin per unit increases because of the $0.05 reduction in variable cost per unit. As a result, she has a higher total contribution margin available to cover fixed expenses. This is good, because the monthly payment on the espresso machine represents an increased fixed cost. Even though the contribution margin ratio increases, it is not enough to totally offset the increase in fixed costs, and her monthly break-even point has risen from $4,125.00 to $4,687.50. If the new break-even point in units is a realistic number (within the relevant range), then she would decide to purchase the new machine because, once it has been paid for, her break-even point will fall and her net income will rise. Performing this analysis is an effective way for managers and business owners to look into the future, so to speak, and see what impact business decisions will have on their financial position.

Let's look at another option the owner of the Back Door Café has to consider when making the decision about this new machine. What would happen if she purchased the new machine to realize the variable cost savings and also raised her price by just $0.20? She feels confident that such a small price increase will go virtually unnoticed by her customers but may help her offset the increase in fixed costs. She runs the analysis as follows:

Selling price, variable cost, and fixed cost change analysis			
	With Current Price	With decreased VC and increased FC	With increased SP, decreased VC, and increased FC
Sales price per unit	$ 3.75	$ 3.75	$ 3.95
Variable cost per unit	$ 1.50	$ 1.45	$ 1.45
Contribution margin per unit	$ 2.25	$ 2.30	$ 2.50
Fixed costs	$ 2,475	$ 2,875	$ 2,875
Break-even in units	1,100	1,250	1,150
Break-even in dollars	$4,125.00	$4,687.50	$4,542.50
Monthly contribution margin income statement			
Unit sales, expected	1,500	1,500	1,500
Sales	$ 5,625	$ 5,625	$ 5,925
Variable costs	2,250	2,175	2,175
Contribution margin	$ 3,375	$ 3,450	$ 3,750
Fixed costs	2,475	2,875	2,875
Net income	$ 900	$ 575	$ 875

The analysis shows the expected result: an increase in the per-unit contribution margin, a decrease in the break-even point, and an increase in the net operating income. She has changed three variables in her costs—sales price, variable cost, and fixed cost. In fact, the small price increase almost gets her back to the net operating income she realized before the purchase of the new expresso machine.

By now, you should begin to understand why CVP analysis is such a powerful tool. The owner of Back Door Café can run an unlimited number of these what-if scenarios until she meets the financial goals for her company. There are very few tools in managerial accounting as powerful and meaningful as a cost-volume-profit analysis.

CONCEPTS IN PRACTICE

Value Menus

In January 2018, McDonald's brought back its $1 value menu. After discontinuing its popular Dollar Menu six years previously, the new version has a list of items priced not only at $1, but at $2 and $3 as well. How can McDonald's afford to offer menu items at this discounted price? Volume! Although the margin on each unit is very small, the food chain hopes to make up the difference in quantity. They also hope that consumers will add higher priced (and higher margin) items to their orders.[1] The strategy is not without its risks, however, as rising food or labor costs could put franchisees in a position where the value pricing does not cover their product costs. Rivals Taco Bell and Dunkin' Donuts have aggressively marketed their value menus, making it almost impossible for McDonald's to ignore the growing trend among consumers for "value pricing." Watch this video (https://openstax.org/l/50BrkEvenChange1) to see what McDonald's is offering consumers.

3.4 Perform Break-Even Sensitivity Analysis for a Multi-Product Environment Under Changing Business Situations

Up to this point in our CVP analysis, we have assumed that a company only sells one product, but we know that, realistically, this is not the case. Most companies operate in a **multi-product environment**, in which they sell different products, manufacture different products, or offer different types of services. Companies price each one of their products or services differently, and the costs associated with each of those products or services vary as well. In addition, companies have limited resources, such as time and labor, and must decide which products to sell or produce and in what quantities, or which services to offer in order to be the most profitable. These profitability considerations are often what contributes substance to a sales mix decision

The Basics of Break-Even Analysis in a Multi-Product Environment

In order to perform a break-even analysis for a company that sells multiple products or provides multiple services, it is important to understand the concept of a sales mix. A **sales mix** represents the relative proportions of the products that a company sells—in other words, the percentage of the company's total revenue that comes from product A, product B, product C, and so forth. Sales mix is important to business owners and managers because they seek to have a mix that maximizes profit, since not all products have the same profit margin. Companies can maximize their profits if they are able to achieve a sales mix that is heavy with high-margin products, goods, or services. If a company focuses on a sales mix heavy with low-margin items, overall company profitability will often suffer.

Performing a break-even analysis for these multi-product businesses is more complex because each product has a different selling price, a different variable cost, and, ultimately, a different contribution margin. We must also proceed under the assumption that the sales mix remains constant; if it does change, the CVP analysis must be revised to reflect the change in sales mix. For the sake of clarity, we will also assume that all costs are companywide costs, and each product contributes toward covering these companywide costs.

THINK IT THROUGH

Selling Subs

You are the manager of a sub shop located near a college campus. The college has recently added a fast-food style café to the student center, which has reduced the number of students eating at your restaurant. Your highest margin items are drinks (a contribution margin of approximately 90%) and vegetarian subs (a contribution margin of approximately 75%). How can you use CVP analysis to help you compete with the college's café? What would you suggest as possible ways to increase business while maintaining target income levels?

Calculating Break-Even Analysis in a Multi-Product Environment

When a company sells more than one product or provides more than one service, break-even analysis is more

1 Zlati Meyer. "McDonald's Hope Customers Buck Up Thursday to New Dollar Menu." *USA Today.* January 3, 2018. https://www.usatoday.com/story/money/2018/01/03/mcdonalds-hopes-customers-buck-up-thursday-new-dollar-menu/996350001/

complex because not all of the products sell for the same price or have the same costs associated with them: Each product has its own margin. Consequently, the break-even point in a multi-product environment depends on the mix of products sold. Further, when the mix of products changes, so does the break-even point. If demand shifts and customers purchase more low-margin products, then the break-even point rises. Conversely, if customers purchase more high-margin products, the break-even point falls. In fact, even if total sales dollars remain unchanged, the break-even point can change based on the sales mix. Let's look at an example of how break-even analysis works in a multi-product environment.

In multi-product CVP analysis, the company's sales mix is viewed as a **composite unit**, a selection of discrete products associated together in proportion to the sales mix. The composite unit is not sold to customers but is a concept used to calculate a combined contribution margin, which is then used to estimate the break-even point. Think of a composite unit as a virtual basket of fruit that contains the proportion of individual fruits equal to the company's sales mix. If we purchased these items individually to make the fruit basket, each one would have a separate price and a different contribution margin. This is how a composite unit works in CVP analysis. We calculate the contribution margins of all of the component parts of the composite unit and then use the total to calculate the break-even point. It is important to note that fixed costs are allocated among the various components (products) that make up this composite unit. Should a product be eliminated from the composite unit or sales mix, the fixed costs must be re-allocated among the remaining products.

If we use the fruit basket as an example, we can look at the individual fruits that make up the basket: apples, oranges, bananas, and pears. We see that each individual fruit has a selling price and a cost. Each fruit has its own contribution margin. But how would we determine the contribution margin for a composite of fruit, or in other words, for our basket of fruit?

For our particular baskets, we will use 5 apples, 3 oranges, 2 bananas, and 1 pear. This means that our product mix is 5:3:2:1, as shown in Figure 3.11.

Fruit	Number of Units	Selling Price per Unit	Total Selling Price	Cost per Unit	Total Cost	Contribution Margin
Apple	5	$0.60	$3.00	$0.25	$1.25	$1.75
Orange	3	1.00	3.00	0.75	2.25	0.75
Banana	2	0.80	1.60	0.50	1.00	0.60
Pear	1	1.90	1.90	1.50	1.50	0.40
Total			$9.50		$6.00	$3.50

Figure 3.11 Contribution Margin Based on Product Mix. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

Notice that the composite contribution margin is based on the number of units of each item that is included in the composite item. If we change the composition of the basket, then the composite contribution margin would change even though contribution margin of the individual items would not change. For example, if we only include 4 apples, the contribution margin of a single apple is still $0.35, but the contribution margin of the apples in the basket is $1.40, not $1.75 as it is when 5 apples are included in the basket. Let's look at an additional example and see how we find the break-even point for a composite good.

We will consider West Brothers for an example of a multi-product break-even analysis. West Brothers manufactures and sells 3 types of house siding: restoration vinyl, architectural vinyl, and builder grade vinyl, each with its own sales price, variable cost, and contribution margin, as shown:

	Sales Price per Square Foot	Variable Cost per Square Foot
Builder Grade	$6.25	$3.25
Architectural	7.75	4.50
Restoration	9.25	6.25

The sales mix for West Brothers is 5 ft^2 of builder grade to 3 ft^2 of architectural grade to 2 ft^2 of restoration grade vinyl (a ratio of 5:3:2). This sales mix represents one composite unit, and the selling price of one composite unit is:

5 ft^2 of Builder Grade at $6.25	$31.25
3 ft^2 of Architectural at $7.75	23.25
2 ft^2 of Restoration at $9.25	18.50
Selling Price of 1 Composite Unit	$73.00

West Brothers' fixed costs are $145,000 per year, and the variable costs for one composite unit are:

5 ft^2 of Builder Grade at $3.25	$16.25
3 ft^2 of Architectural at $4.50	13.50
2 ft^2 of Restoration at $6.25	12.50
Variable Costs of 1 Composite Unit	$42.25

We will calculate the contribution margin of a composite unit for West Brothers using the same formula as before:

Selling Price per Composite Unit − **Variable Cost per Composite Unit** = **Contribution Margin per Composite Unit**

Applying the formula, we determine that $73 – $42.25 = 30.75. We then use the contribution margin per composite unit to determine West Brothers' break-even point:

$$\text{Break-Even Point per Composite Unit} = \frac{\text{Total fi ed costs}}{\text{Contribution margin per composite unit}} = \frac{\$145{,}000}{\$30.75} = 4{,}715.45 \text{ composite units}$$

West Brothers will break even when it sells 4,715.45 (or 4,716 since it can't sell a partial unit) composite units. To determine how many of each product West Brothers needs to sell, we apply their sales mix ratio (5:3:2) to the break-even quantity as follows:

Builder Grade	5 × 4,715.45	23,577
Architectural	3 × 4,715.45	14,146
Restoration	2 × 4,715.45	9,431
Total Units		47,154

Using a forecasted or estimated contribution margin income statement, we can verify that the quantities listed will place West Brothers at break-even.

WEST BROTHERS Forecasted Contribution Margin Income Statement at Break-Even For Month Ended December 31, 2019	
Sales	
Builder grade (23,577 at $6.25)	$147,358
Architectural (14,146 at $7.75)	109,634
Restoration (9,431 at $9.25)	87,236
Total Sales	344,228
Variable Costs	
Builder Grade (23,577 at $3.25)	76,626
Architectural (14,146 at $4.50)	63,659
Restoration (9,431 at $9.25)	58,943
Total Variable Costs	199,228
Contribution Margin	145,000
Fixed Costs	145,000
Net Income	0

West Brothers can use this CVP analysis for a wide range of business decisions and for planning purposes. Remember, however, that if the sales mix changes from its current ratio, then the break-even point will change. For planning purposes, West Brothers can change the sales mix, sales price, or variable cost of one or more of the products in the composite unit and perform a "what-if" analysis.

YOUR TURN

Margins in the Sales Mix

The sales mix of a company selling two products, A and B, is 3:1. The per-unit variable costs is $4 for Product A and $5 for Product B. Product A sells for $10 and product B sells for $9. Fixed costs for the company are $220,000.

A. What is the contribution margin per composite unit?
B. What is the break-even point in composite units?
C. How many units of product A and product B will the company sell at the break-even point?

Solution

A.

Product	Sales Price per Unit	Variable Cost per Unit	Contribution Margin per Unit
A	$8	$5	$3
B	9	5	4

B.

Sales Price	Variable Cost	Contribution Margin
$33	$20	$13

Break-even per composite unit = 15,385.

C.

Number of units per product		
A	3 × 15,385	46,155
B	1 × 15,385	15,385
Sales		
	Product A	$369,231
	Product B	$138,462
	Total sales	$507,692
Variable costs		
	Product A	$230,769
	Product B	$ 76,923
	Total variable costs	$307,692
Contribution margin		$200,000
Fixed costs		$200,000
Net Income		$ 0

3.5 Calculate and Interpret a Company's Margin of Safety and Operating Leverage

Our discussion of CVP analysis has focused on the sales necessary to break even or to reach a desired profit, but two other concepts are useful regarding our break-even sales. Those concepts are margin of safety and operating leverage.

Margin of Safety

A company's **margin of safety** is the difference between its current sales and its break-even sales. The margin of safety tells the company how much they could lose in sales before the company begins to lose money, or, in other words, before the company falls below the break-even point. The higher the margin of safety is, the lower the risk is of not breaking even or incurring a loss. In order to calculate margin of safety, we use the following formula:

Margin of Safety in Dollars = Total Budgeted (or actual sales) – Break-Even Sales

Let's look at Manteo Machine, a company that machines parts that are then sold and used in the manufacture of farm equipment. For their core product, the break-even analysis is as follows:

Sales Price per Unit	$ 90
Variable Cost per Unit	$ 40
Contribution Margin per Unit	$ 50
Fixed Costs	$ 85,000
Break-Even (in units)	1700
Contribution Margin per Unit	$ 50
Selling Price per Unit	$ 90
Contribution Margin Ratio	55.55%
Break-Even (in dollars)	$151,786

Interpreting this information tells Manteo Machine that, when sales equal $153,000, they will be at the break-even point. However, as soon as sales fall below this figure, they will have negative net operating income. They have decided that they want a margin of safety of $10,000. They can add this as if it were a fixed cost (very much the same way we added target profit earlier) and then find a new break-even point that includes a $10,000 margin of safety. If they approached it from this perspective, their new break-even would appear as follows:

Sales Price per Unit	$ 90
Variable Cost per Unit	$ 40
Contribution Margin per Unit	$ 50
Fixed Costs + Margin of Safety	$ 95,000
Break-Even (in units)	1900
Contribution Margin per Unit	$ 50
Selling Price per Unit	$ 90
Contribution Margin Ratio	55.55%
Break-Even (in dollars)	$169,643

Figure 3.12 Manteo Machine's Margin of Safety. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

As shown in Figure 3.12, the margin of safety of 1,900 units is found from (FC + Margin of Safety)/CM per unit = $95,000/$50. Thus, 1,900 units must be sold in order to meet fixed cost and have a $10,000 margin of safety. Another way to see this is to realize the $10,000 margin of safety will be met in $50 increments based on the current contribution margin. This means the company will need to sell an additional 200 units, which is an additional $18,000 in sales to have the desired margin of safety. The true break-even, where only fixed costs were met, was 1,700 units, or $153,000 in sales. The point at which the company would have a $10,000 margin of safety is 1,900 units, or $171,000 in sales. Note that the new level of units is the break-even units of 1,700 plus the 200 units for the margin of safety. The same can be seen for the sales dollar. The new level of desired sales dollars is the break-even sales of $153,000 plus the additional $18,000 in sales for the margin of safety.

The margin of safety can also be determined when a company knows its sales volume. For example, Manteo Machine sold 2,500 units in March and wants to know its margin of safety at that sales volume:

Sales (at the current volume of 2,500 units)	$225,000
Break-Even Sales (1,900 units)	153,000
Margin of Safety (in dollars)	72,000

From this analysis, Manteo Machine knows that sales will have to decrease by $72,000 from their current level before they revert to break-even operations and are at risk to suffer a loss.

ETHICAL CONSIDERATIONS

The Importance of Relevant Range Analysis

Ethical managerial decision-making requires that information be communicated fairly and objectively. The failure to include the demand for individual products in the company's mixture of products may be misleading. Providing misleading or inaccurate managerial accounting information can lead to a company becoming unprofitable. Ignoring relevant range(s) in setting assumptions about cost behavior and ignoring the actual demand for the product in the company's market also distorts the information provided to management and may cause the management of the company to produce products that cannot be sold.

Many companies prefer to consider the margin of safety as a percentage of sales, rather than as a dollar amount. In order to express margin of safety as a percentage, we divide the margin of safety (in dollars) by the total budgeted or actual sales volume. The formula to express margin of safety as a percentage is:

$$\text{Margin of Safety Percentage} = \frac{\text{Margin of Safety (dollars)}}{\text{Total Budget (or Actual) Sales (dollars)}}$$

Previously, we calculated Manteo Machine's margin of safety as $72,000. As a percentage, it would be

$$\frac{\$72{,}000}{\$225{,}000} = 0.32 \text{ or } 32\%$$

This tells management that as long as sales do not decrease by more than 32%, they will not be operating at or near the break-even point, where they would run a higher risk of suffering a loss. Often, the margin of safety is determined when sales budgets and forecasts are made at the start of the fiscal year and also are regularly revisited during periods of operational and strategic planning.

Operating Leverage

In much the same way that managers control the risk of incurring a net loss by watching their margin of safety, being aware of the company's operating leverage is critical to the financial well-being of the firm. **Operating leverage** is a measurement of how sensitive net operating income is to a percentage change in sales dollars. Typically, the higher the level of fixed costs, the higher the level of risk. However, as sales volumes increase, the payoff is typically greater with higher fixed costs than with higher variable costs. In other words, the higher the risk the greater the payoff.

First, let's look at this from a general example to understand payoff. Suppose you had $10,000 to invest and you were debating between putting that money in low risk bonds earning 3% or taking a chance and buying stock in a new company that currently is not profitable but has an innovative product that many analysts predict will take off and be the next "big thing." Obviously, there is more risk with buying the stock than with buying the bonds. If the company remains unprofitable, or fails, you stand to lose all or a portion of your investment ,whereas the bonds are less risky and will continue to pay 3% interest. However, the risk associated with the stock investment could result in a much higher payoff if the company is successful.

So how does this relate to fixed costs and companies? Companies have many types of fixed costs including salaries, insurance, and depreciation. These costs are present regardless of our production or sales levels. This makes fixed costs riskier than variable costs, which only occur if we produce and sell items or services. As we sell items, we have learned that the contribution margin first goes to meeting fixed costs and then to profits. Here is an example of how changes in fixed costs affects profitability.

Gray Co. has the following income statement:

Sales (10,000 units x $10 SP)	$100,000
Variable Costs (10,000 units x $4 VC)	$ 40,000
Contribution Margin	$ 60,000
Fixed Costs	$ 25,000
Net Income	$ 35,000

What is the effect of switching $10,000 of fixed costs to variable costs? What is the effect of switching $10,000 of variable costs to fixed costs?

Effect of Changing $10,000 of FC to VC	
Sales (10,000 units x $10 SP)	$100,000
Variable Costs	50,000
Contribution Margin	50,000
Fixed Costs	15,000
Net Income	35,000

Effect of Changing $10,000 of VC to FC	
Sales (10,000 units x $10 SP)	$100,000
Variable Costs	30,000
Contribution Margin	70,000
Fixed Costs	35,000
Net Income	35,000

Notice that in this instance, the company's net income stayed the same. Now, look at the effect on net income of changing fixed to variable costs or variable costs to fixed costs as sales volume increases. Assume sales volume increase by 10%.

Effect of Changing $10,000 of FC to VC and 10% Increase in Sales	
Sales (11,000 units x $10 SP)	$110,000
Variable Costs (also increases 10%)	$ 55,000
Contribution Margin	$ 55,000
Fixed Costs	$ 15,000
Net Income	$ 40,000

Effect of Changing $10,000 of VC to FC and 10% Increase in Sales	
Sales (11,000 units x $10 SP)	$110,000
Variable Costs (also increases 10%)	$ 33,000
Contribution Margin	$ 77,000
Fixed Costs	$ 35,000
Net Income	$ 45,000

As you can see from this example, moving variable costs to fixed costs, such as making hourly employees salaried, is riskier in that fixed costs are higher. However, the payoff, or resulting net income, is higher as sales volume increases.

This is why companies are so concerned with managing their fixed and variable costs and will sometimes move costs from one category to another to manage this risk. Some examples include, as previously mentioned, moving hourly employees (variable) to salaried employees (fixed), or replacing an employee (variable) with a machine (fixed). Keep in mind that managing this type of risk not only affects operating leverage but can have an effect on morale and corporate climate as well.

CONCEPTS IN PRACTICE

Fluctuating Operating Leverage: Why Do Stores Add Self-Service Checkout Lanes?

Operating leverage fluctuations result from changes in a company's cost structure. While any change in either variable or fixed costs will change operating leverage, the fluctuations most often result from management's decision to shift costs from one category to another. As the next example shows, the advantage can be great when there is economic growth (increasing sales); however, the disadvantage can be just as great when there is economic decline (decreasing sales). This is the risk that must be managed when deciding how and when to cause operating leverage to fluctuate.

Consider the impact of reducing variable costs (fewer employee staffed checkout lanes) and increasing fixed costs (more self-service checkout lanes). A store with $125,000,000 per year in sales installs some self-service checkout lanes. This increases its fixed costs by 10% but reduces its variable costs by 5%. As Figure 3.13 shows, at the current sales level, this could produce a whopping 35% increase in net operating income. And, if the change results in higher sales, the increase in net operating income would be even more dramatic. Do the math and you will see that each 1% increase in sales would produce a 6% increase in net operating income: well worth the change, indeed.

	Without Self-service Checkout Lanes	With Self-service Checkout Lanes
Sales	$125,000	$125,000
Variable Costs	$ 93,750	$ 89,063
Contribution Margin	$ 31,250	$ 35,937
Fixed costs	$ 25,000	$ 27,500
Net Operating Income	$ 6,250	$ 8,437
% Increase in Income		35%

Figure 3.13 Impact of Self-Service Checkout Lanes. (attribution: Copyright Rice University, OpenStax, under CC BY-NC-SA 4.0 license)

(in 000s) Without Selfservice Checkout Lanes, With Selfservice Checkout Lanes (respectively): Sales $125,000, 125,000; Variable Costs 93,750, 89,063; Contribution Margin 31,250, 35,938; Fixed Costs 25,000, 27,500; Net Operating Income 6,250 8,438; Percent Increase in Income 35 percent.

The company in this example also faces a downside risk, however. If customers disliked the change enough that sales decreased by more than 6%, net operating income would drop below the original level of $6,250 and could even become a loss.

Operating leverage has a multiplier effect. A **multiplier effect** is one in which a change in an input (such as variable cost per unit) by a certain percentage has a greater effect (a higher percentage effect) on the output (such as net income). To explain the concept of a multiplier effect, think of having to open a very large, heavy wooden crate. You could pull and pull with your hands all day and still not exert enough force to get it open. But, what if you used a lever in the form of a pry bar to multiply your effort and strength? For every additional amount of force you apply to the pry bar, a much larger amount of force is applied to the crate. Before you

know it, you have the crate open. Operating leverage works much like that pry bar: if operating leverage is high, then a very small increase in sales can result in a large increase in net operating income.

How does a company increase its operating leverage? Operating leverage is a function of cost structure, and companies that have a high proportion of fixed costs in their cost structure have higher operating leverage. There is, however, a cautionary side to operating leverage. Since high operating leverage is the result of high fixed costs, if the market for the company's products, goods, or services shrinks, or if demand for the company's products, goods, or services declines, the company may find itself obligated to pay for fixed costs with little or no sales revenue to spare. Managers who have made the decision to chase large increases in net operating income through the use of operating leverage have found that, when market demand falls, their only recourse is to close their doors. In fact, many large companies are making the decision to shift costs *away* from fixed costs to protect them from this very problem.

LINK TO LEARNING

During periods of sales downturns, there are many examples of companies working to shift costs away from fixed costs. This Yahoo Finance article reports that many airlines are changing their cost structure to move away from fixed costs and toward variable costs (https://openstax.org/l/50AirlineVarCst) such as Delta Airlines. Although they are decreasing their operating leverage, the decreased risk of insolvency more than makes up for it.

In order to calculate the degree of operating leverage at a given level of sales, we will apply the following formula:

$$\text{Degree of Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Net Operating Income}}$$

To explain further the concept of operating leverage, we will look at two companies and their operating leverage positions:

	Company A	Company B
Sales	$250,000	$315,000
Variable Costs	102,000	105,000
Contribution Margin (a)	148,000	210,000
Fixed Costs	63,000	125,000
Net Income (loss) (b)	85,000	85,000
Operating Leverage (a) ÷ (b)	**1.74**	**2.47**

Both companies have the same net income of $85,000, but company B has a higher degree of operating leverage because its fixed costs are higher than that of company A. If we want to see how operating leverage impacts net operating income, then we can apply the following formula:

$$\text{Degree of Operating Leverage} \times \text{Percentage Change in Sales} = \text{Percentage Change in Net Operating Income}$$

Let's assume that both company A and company B are anticipating a 10% increase in sales. Based on their respective degrees of operating leverage, what will their percentage change in net operating income be?

$$\text{Company A: } 1.71 \times 10\% = 17.4\%$$
$$\text{Company B: } 2.47 \times 10\% = 24.7\%$$

For company A, for every 10% increase in sales, net operating income will increase 17.4%. But company B has a much higher degree of operating leverage, and a 10% increase in sales will result in a 24.7% increase in net operating income. These examples clearly show why, during periods of growth, companies have been willing to risk incurring higher fixed costs in exchange for large percentage gains in net operating income. But what happens in periods where income declines?

We will return to Company A and Company B, only this time, the data shows that there has been a 20% decrease in sales. Note that the degree of operating leverage changes for each company. The reduced income resulted in a higher operating leverage, meaning a higher level of risk.

	Company A	Company B
Sales (20% decrease)	$200,000	$252,000
Variable Costs (20% decrease)	81,600	84,000
Contribution Margin (a)	118,400	168,000
Fixed Costs	63,000	125,000
Net Income (b)	$ 55,400	$ 43,000
Operating Leverage (a ÷ b)	2.14	3.91
% Change in Net Income (Prior Net Income – Current Net Income)/Prior Net Income	34.8% decrease	49.4% decrease

It is equally important to realize the percentage decrease in income for both companies. The decrease in sales by 20% resulted in a 31.9% decrease in net income for Company A. For Company B, the 20% decrease in sales resulted in a 46.9% decrease in net income. This also could have been found by taking the initial operating leverage times the 20% decrease:

$$\text{Company A: } 20\% \text{ decreases} \times 1.74 \text{ operating leverage} = 34.8\% \text{ decrease in net income}$$
$$\text{Company B: } 20\% \text{ decreases} \times 2.47 \text{ operating leverage} = 49.4\% \text{ decrease in net income}$$

This example also shows why, during periods of decline, companies look for ways to reduce their fixed costs to avoid large percentage reductions in net operating income.

THINK IT THROUGH

Moving Costs

You are the managerial accountant for a large manufacturing firm. The company has sales that are well above its break-even point, but they have historically carried most of their costs as fixed costs. The outlook for the industry you are in is not positive. How could you move more costs away from fixed costs to put the company in a better financial position if the industry does, in fact, take a downturn?

CONTINUING APPLICATION AT WORK

Viking Grocery Stores

You might wonder why the grocery industry is not comparable to other big-box retailers such as hardware or large sporting goods stores. Just like other big-box retailers, the grocery industry has a similar product mix, carrying a vast of number of name brands as well as house brands. The main difference, then, is that the profit margin per dollar of sales (i.e., profitability) is smaller than the typical big-box retailer. Also, the inventory turnover and degree of product spoilage is greater for grocery stores. Overall, while the fixed and variable costs are similar to other big-box retailers, a grocery store must sell vast quantities in order to create enough revenue to cover those costs.

This is reflected in the business plan. Unlike a manufacturer, a grocery store will have hundreds of products at one time with various levels of margin, all of which will be taken into account in the development of their break-even analysis. Review a business plan developed by Viking Grocery Stores (https://openstax.org/l/GroceryStore) in consideration of opening a new site in Springfield, Missouri to see how a grocery store develops a business plan and break-even based upon multiple products.

Key Terms

break-even point dollar amount (total sales dollars) or production level (total units produced) at which the company has recovered all variable and fixed costs; it can also be expressed as that point where Total Cost (TC) = Total Revenue (TR)

composite unit selection of discrete products associated together in relation or proportion to their sales mix

contribution margin amount by which a product's selling price exceeds its total variable cost per unit

contribution margin ratio percentage of a unit's selling price that exceeds total unit variable costs

margin of safety difference between current sales and break-even sales

multi-product environment business environment in which a company sells different products, manufactures different products, or offers different types of services

multiplier effect when the change in an input by a certain percentage has a greater effect (a higher percentage effect) on the output

operating leverage measurement of how sensitive net operating income is to a percentage change in sales dollars

relevant range quantitative range of units that can be produced based on the company's current productive assets; for example, if a company has sufficient fixed assets to produce up to 10,000 units of product, the relevant range would be between 0 and 10,000 units

sales mix relative proportions of the products that a company sells

sensitivity analysis what will happen if sales price, units sold, variable cost per unit, or fixed costs change

target pricing process in which a company uses market analysis and production information to determine the maximum price customers are willing to pay for a good or service in addition to the markup percentage

total contribution margin amount by which total sales exceed total variable costs

Summary

3.1 Explain Contribution Margin and Calculate Contribution Margin per Unit, Contribution Margin Ratio, and Total Contribution Margin

- Contribution margin can be used to calculate how much of every dollar in sales is available to cover fixed expenses and contribute to profit.
- Contribution margin can be expressed on a per-unit basis, as a ratio, or in total.
- A specialized income statement, the Contribution Margin Income Statement, can be useful in looking at total sales and total contribution margin at varying levels of activity.

3.2 Calculate a Break-Even Point in Units and Dollars

- Break-even analysis is a tool that almost any business can use for planning and evaluation purposes. It helps identify a level of activity that is necessary before an organization starts to generate a profit.
- A break-even point can be found on a per-unit basis or as a dollar amount, depending upon whether a per-unit contribution margin or a contribution margin ratio is applied.

3.3 Perform Break-Even Sensitivity Analysis for a Single Product Under Changing Business Situations

- Cost-volume-profit analysis can be used to conduct a sensitivity analysis that shows what will happen if there are changes in any of the variables: sales price, units sold, variable cost per unit, or fixed costs.
- The break-even point may or may not be impacted by changes in costs depending on the type of cost affected.

3.4 Perform Break-Even Sensitivity Analysis for a Multi-Product Environment Under Changing Business Situations

- Companies provide multiple products, goods, and services to the consumer and, as result, need to calculate their break-even point based on the mix of the products, goods, and services.
- In a multi-product environment, calculating the break-even point is more complex and is usually calculated using a composite unit, which represents the sales mix of the business.
- If the sales mix of a company changes, then the break-even point changes, regardless of whether total sales dollars change or not.

3.5 Calculate and Interpret a Company's Margin of Safety and Operating Leverage

- Businesses determine a margin of safety (sales dollars beyond the break-even point). The higher the margin of safety is, the lower the risk is of not breaking even and incurring a loss.
- Operating leverage is a measurement of how sensitive net operating income is to a percentage change in sales dollars. A high degree of operating leverage results from a cost structure that is heavily weighted in fixed costs.

Multiple Choice

1. LO 3.1 The amount of a unit's sales price that helps to cover fixed expenses is its _____.

A. contribution margin
B. profit
C. variable cost
D. stepped cost

2. LO 3.1 A company's product sells for $150 and has variable costs of $60 associated with the product. What is its contribution margin per unit?

A. $40
B. $60
C. $90
D. $150

3. LO 3.1 A company's product sells for $150 and has variable costs of $60 associated with the product. What is its contribution margin ratio?

A. 10%
B. 40%
C. 60%
D. 90%

4. LO 3.1 A company's contribution margin per unit is $25. If the company increases its activity level from 200 units to 350 units, how much will its total contribution margin increase?

A. $1,250
B. $3,750
C. $5,000
D. $8,750

5. LO 3.2 A company sells its products for $80 per unit and has per-unit variable costs of $30. What is the contribution margin per unit?

A. $30
B. $50
C. $80
D. $110

6. LO 3.2 If a company has fixed costs of $6,000 per month and their product that sells for $200 has a contribution margin ratio of 30%, how many units must they sell in order to break even?

A. 100
B. 180
C. 200
D. 2,000

7. LO 3.2 Company A wants to earn $5,000 profit in the month of January. If their fixed costs are $10,000 and their product has a per-unit contribution margin of $250, how many units must they sell to reach their target income?

A. 20
B. 40
C. 60
D. 120

8. LO 3.2 A company has wants to earn an income of $60,000 after-taxes. If the tax rate is 32%, what must be the company's pre-tax income in order to have $60,000 after-taxes?

A. $88,235
B. $19,200
C. $79,200
D. $143,000

9. LO 3.2 A company has pre-tax or operating income of $120,000. If the tax rate is 40%, what is the company's after-tax income?

A. $300,000
B. $240,000
C. $48,000
D. $72,000

10. LO 3.3 When sales price increases and all other variables are held constant, the break-even point will _____.

A. remain unchanged
B. increase
C. decrease
D. produce a lower contribution margin

11. LO 3.3 When sales price decreases and all other variables are held constant, the break-even point will _____.

A. remain unchanged
B. increase
C. decrease
D. produce a higher contribution margin

12. LO 3.3 When variable costs increase and all other variables remain unchanged, the break-even point will _____.

A. remain unchanged
B. increase
C. decrease
D. produce a lower contribution margin

13. LO 3.3 When fixed costs decrease and all other variables remain unchanged, the break-even point will _____.

A. remain unchanged
B. increase
C. decrease
D. produce a lower contribution margin

14. LO 3.3 When fixed costs increase and all other variables remain unchanged, the contribution margin will _____.

A. remain unchanged
B. increase
C. decrease
D. increase variable costs per unit

15. LO 3.4 If the sales mix in a multi-product environment shifts to a higher volume in low contribution margin products, the break-even point will _____.

A. remain unchanged because all products are included in the calculation of break-even
B. increase because the low contribution margin products have little effect on break-even
C. increase because the per composite unit contribution margin will decrease
D. decrease because the per composite unit contribution margin will increase

16. LO 3.4 Break-even for a multiple product firm _____.

A. can be calculated by dividing total fixed costs by the contribution margin of a composite unit
B. can be calculated by multiplying fixed costs by the contribution margin ratio of a composite unit
C. can only be calculated when the proportion of products sold is the same for all products
D. can be calculated by multiplying fixed costs by the contribution margin ratio of the most common product in the sales mix

17. LO 3.4 Waskowski Company sells three products (A, B, and C) with a sales mix of 3:2:1. Unit sales price are shown. What is the sales price per composite unit?

Product A	Product B	Product C
$7	$4	$6

A. $17.00
B. $25.00
C. $35.00
D. $20.00

18. LO 3.4 Beaucheau Farms sells three products (E, F, and G) with a sale mix ratio of 3:1:2. Unit sales price are shown. What is the sales price per composite unit?

Product E	Product F	Product G
$11	$8	$9

A. $28.00
B. $20.00
C. $59.00
D. $41.00

19. LO 3.4 A company sells two products, Model 101 and Model 202. For every one unit of Model 101, they sell they sell two units of Model 202. Sales and cost information for the two products is shown. What is the contribution margin for a composite unit based on the sales mix?

	Sales Price	Variable Cost
Model 101	$25	$11
Model 202	28	7

A. $14
B. $21
C. $35
D. $56

20. LO 3.5 Wallace Industries has total contribution margin of $58,560 and net income of $24,400 for the month of April. Wallace expects sales volume to increase by 5% in May. What are the degree of operating leverage and the expected percent change in income for Wallace Industries?

A. 0.42 and 2.2%
B. 0.42 and 5%
C. 2.4 and 12%
D. 2.5 and 13%

21. LO 3.5 Macom Manufacturing has total contribution margin of $61,250 and net income of $24,500 for the month of June. Marcus expects sales volume to increase by 10% in July. What are the degree of operating leverage and the expected percent change in income for Macom Manufacturing?

A. 0.4 and 10%
B. 2.5 and 10%
C. 2.5 and 25%
D. 5.0 and 50%

22. LO 3.5 If a firm has a contribution margin of $59,690 and a net income of $12,700 for the current month, what is their degree of operating leverage?

A. 0.18
B. 1.18
C. 2.4
D. 4.7

23. LO 3.5 If a firm has a contribution margin of $78,090 and a net income of $13,700 for the current month, what is their degree of operating leverage?

A. 0.21
B. 1.21
C. 2.4
D. 5.7

Questions

1. LO 3.1 Define and explain contribution margin on a per unit basis.

2. LO 3.1 Define and explain contribution margin ratio.

3. LO 3.1 Explain how a contribution margin income statement can be used to determine profitability.

4. LO 3.2 In a cost-volume-profit analysis, explain what happens at the break-even point and why companies do not want to remain at the break-even point.

5. LO 3.2 What is meant by a product's contribution margin ratio and how is this ratio useful in planning business operations?

6. LO 3.3 Explain how a manager can use CVP analysis to make decisions regarding changes in operations or pricing structure.

7. LO 3.3 After conducting a CVP analysis, most businesses will then recreate a revised or projected income statement incorporating the results of the CVP analysis. What is the benefit of taking this extra step in the analysis?

8. LO 3.3 Explain how it is possible for costs to change without changing the break-even point.

9. LO 3.4 Explain what a sales mix is and how changes in the sales mix affect the break-even point.

10. LO 3.4 Explain how break-even analysis for a multi-product company differs from a company selling a single product.

11. LO 3.5 Explain margin of safety and why it is an important measurement for managers.

12. LO 3.5 Define operating leverage and explain its importance to a company and how it relates to risk.

Exercise Set A

EA1. LO 3.1 Calculate the per-unit contribution margin of a product that has a sale price of $200 if the variable costs per unit are $65.

EA2. LO 3.1 Calculate the per-unit contribution margin of a product that has a sale price of $400 if the variable costs per unit are $165.

EA3. LO 3.1 A product has a sales price of $150 and a per-unit contribution margin of $50. What is the contribution margin ratio?

EA4. LO 3.1 A product has a sales price of $250 and a per-unit contribution margin of $75. What is the contribution margin ratio?

EA5. LO 3.2 Maple Enterprises sells a single product with a selling price of $75 and variable costs per unit of $30. The company's monthly fixed expenses are $22,500.

A. What is the company's break-even point in units?
B. What is the company's break-even point in dollars?
C. Construct a contribution margin income statement for the month of September when they will sell 900 units.
D. How many units will Maple need to sell in order to reach a target profit of $45,000?
E. What dollar sales will Maple need in order to reach a target profit of $45,000?
F. Construct a contribution margin income statement for Maple that reflects $150,000 in sales volume.

EA6. LO 3.2 Marlin Motors sells a single product with a selling price of $400 with variable costs per unit of $160. The company's monthly fixed expenses are $36,000.

A. What is the company's break-even point in units?
B. What is the company's break-even point in dollars?
C. Prepare a contribution margin income statement for the month of November when they will sell 130 units.
D. How many units will Marlin need to sell in order to realize a target profit of $48,000?
E. What dollar sales will Marlin need to generate in order to realize a target profit of $48,000?
F. Construct a contribution margin income statement for the month of February that reflects $200,000 in sales revenue for Marlin Motors.

EA7. LO 3.3 Flanders Manufacturing is considering purchasing a new machine that will reduce variable costs per part produced by $0.15. The machine will increase fixed costs by $18,250 per year. The information they will use to consider these changes is shown here.

	Current
Units sold	216,000
Sales price per unit	$ 2.15
Variable cost per unit	$ 1.75
Contribution margin per unit	$ 0.40
Fixed costs	$ 56,000
Break-even (in units)	140,000
Break-even (in dollars)	$301,000
Sales	$464,400
Variable costs	$378,000
Contribution margin	$ 86,400
Fixed costs	$ 56,000
Net income (loss)	$ 30,400

EA8. LO 3.3 Marchete Company produces a single product. They have recently received the results of a market survey that indicates that they can increase the retail price of their product by 8% without losing customers or market share. All other costs will remain unchanged. Their most recent CVP analysis is shown. If they enact the 8% price increase, what will be their new break-even point in units and dollars?

	Current
Units sold	950
Sales price per unit	$ 125
Variable cost per unit	$ 98
Contribution margin per unit	$ 27
Fixed costs	$ 23,000
Break-even (in units)	852
Break-even (in dollars)	$106,500
Sales	$118,750
Variable costs	$ 93,100
Contribution margin	$ 25,650
Fixed costs	$ 23,000
Net income (loss)	$ 2,650

EA9. LO 3.3 Brahma Industries sells vinyl replacement windows to home improvement retailers nationwide. The national sales manager believes that if they invest an additional $25,000 in advertising, they would increase sales volume by 10,000 units. Prepare a forecasted contribution margin income statement for Brahma if they incur the additional advertising costs, using this information:

Sales (6,500 units at $115)	$747,500
Variable costs (6,500 units at $69)	448,500
Contribution margin	299,000
Fixed costs	19,500
Net income (loss)	279,500

EA10. LO 3.4 Salvador Manufacturing builds and sells snowboards, skis and poles. The sales price and variable cost for each are shown:

Product	Sellings price per unit	Variable cost per unit
Snowboards	$320.00	$170.00
Skis	$400.00	$225.00
Poles	$ 50.00	$ 20.00

Their sales mix is reflected in the ratio 7:3:2. What is the overall unit contribution margin for Salvador with their current product mix?

EA11. LO 3.4 Salvador Manufacturing builds and sells snowboards, skis and poles. The sales price and variable cost for each follows:

Product	Sellings price per unit	Variable cost per unit
Snowboards	$320.00	$170.00
Skis	$400.00	$225.00
Poles	$ 50.00	$ 20.00

Their sales mix is reflected in the ratio 7:3:2. If annual fixed costs shared by the three products are $196,200, how many units of each product will need to be sold in order for Salvador to break even?

EA12. LO 3.4 Use the information from the previous exercises involving Salvador Manufacturing to determine their break-even point in sales dollars.

EA13. LO 3.5 Company A has current sales of $10,000,000 and a 45% contribution margin. Its fixed costs are $3,000,000. Company B is a service firm with current service revenue of $5,000,000 and a 20% contribution margin. Company B's fixed costs are $500,000. Compute the degree of operating leverage for both companies. Which company will benefit most from a 25% increase in sales? Explain why.

EA14. LO 3.5 Marshall & Company produces a single product and recently calculated their break-even point as shown.

	Current
Units sold	400
Sales price per unit	$ 550
Variable cost per unit	$ 375
Contribution margin per unit	$ 175
Fixed costs	$ 3,500
Break-even (in units)	20
Contribution margin ratio	31.82%
Break-even (in dollars)	$11,000

What would Marshall's target margin of safety be in units and dollars if they required a $14,000 margin of safety?

Exercise Set B

EB1. LO 3.1 Calculate the per-unit contribution margin of a product that has a sale price of $150 if the variable costs per unit are $40.

EB2. LO 3.1 Calculate the per-unit contribution margin of a product that has a sale price of $350 if the variable costs per unit are $95.

EB3. LO 3.1 A product has a sales price of $175 and a per-unit contribution margin of $75. What is the contribution margin ratio?

EB4. LO 3.1 A product has a sales price of $90 and a per-unit contribution margin of $30. What is the contribution margin ratio?

EB5. LO 3.2 Cadre, Inc., sells a single product with a selling price of $120 and variable costs per unit of $90. The company's monthly fixed expenses are $180,000.

A. What is the company's break-even point in units?
B. What is the company's break-even point in dollars?
C. Prepare a contribution margin income statement for the month of October when they will sell 10,000 units.
D. How many units will Cadre need to sell in order to realize a target profit of $300,000?
E. What dollar sales will Cadre need to generate in order to realize a target profit of $300,000?
F. Construct a contribution margin income statement for the month of August that reflects $2,400,000 in sales revenue for Cadre, Inc.

EB6. LO 3.2 Kerr Manufacturing sells a single product with a selling price of $600 with variable costs per unit of $360. The company's monthly fixed expenses are $72,000.

A. What is the company's break-even point in units?
B. What is the company's break-even point in dollars?
C. Prepare a contribution margin income statement for the month of January when they will sell 500 units.
D. How many units will Kerr need to sell in order to realize a target profit of $120,000?
E. What dollar sales will Kerr need to generate in order to realize a target profit of $120,000?
F. Construct a contribution margin income statement for the month of June that reflects $600,000 in sales revenue for Kerr Manufacturing.

EB7. LO 3.2 Delta Co. sells a product for $150 per unit. The variable cost per unit is $90 and fixed costs are $15,250. Delta Co.'s tax rate is 36% and the company wants to earn $44,000 after taxes.

A. What would be Delta's desired pre-tax income?
B. What would be break-even point in units to reach the income goal of $44,000 after taxes?
C. What would be break-even point in sales dollars to reach the income goal of $44,000 after taxes?
D. Create a contribution margin income statement to show that the break-even point calculated in B, generates the desired after-tax income.

EB8. LO 3.3 Shonda & Shonda is a company that does land surveys and engineering consulting. They have an opportunity to purchase new computer equipment that will allow them to render their drawings and surveys much more quickly. The new equipment will cost them an additional $1,200 per month, but they will be able to increase their sales by 10% per year. Their current annual cost and break-even figures are as follows:

	Current
Units sold	1,400
Sales price per unit	$ 225
Variable cost per unit	$ 145
Fixed costs	$ 52,000
Break-even (in units)	650
Contribution margin ratio	$ 0.36
Break-even (in dollars)	$146,250
Sales	$315,000
Variable costs	$203,000
Contribution margin	$112,000
Fixed costs	$ 52,000
Net income (loss)	$ 60,000

A. What will be the impact on the break-even point if Shonda & Shonda purchases the new computer?
B. What will be the impact on net operating income if Shonda & Shonda purchases the new computer?
C. What would be your recommendation to Shonda & Shonda regarding this purchase?

EB9. LO 3.3 Baghdad Company produces a single product. They have recently received the result of a market survey that indicates that they can increase the retail price of their product by 10% without losing customers or market share. All other costs will remain unchanged. If they enact the 10% price increase, what will be their new break-even point in units and dollars? Their most recent CVP analysis is:

	Current
Units sold	1,450
Sales price per unit	$ 90
Variable cost per unit	$ 40
Contribution margin per unit	$ 50
Fixed costs	$ 20,650
Break-even (in units)	413
Break-even (in dollars)	$ 37,170
Sales	$130,500
Variable costs	$ 58,000
Contribution margin	$ 72,500
Fixed costs	$ 20,650
Net income (loss)	$ 51,850

EB10. LO 3.3 Keleher Industries manufactures pet doors and sells them directly to the consumer via their web site. The marketing manager believes that if the company invests in new software, they will increase their sales by 10%. The new software will increase fixed costs by $400 per month. Prepare a forecasted contribution margin income statement for Keleher Industries reflecting the new software cost and associated increase in sales. The previous annual statement is as follows:

Sales (3,100 units at $250)	$775,000
Variable costs (3,100 units at $115)	356,500
Contribution margin	418,500
Fixed costs	19,500
Net income (loss)	399,000

EB11. LO 3.4 JJ Manufacturing builds and sells switch harnesses for glove boxes. The sales price and variable cost for each follows:

Product	Selling price per unit	Variable cost per unit
Trunk switch	$60.00	$28.00
Gas door switch	$75.00	$33.00
Glove box light	$40.00	$22.00

Their sales mix is reflected in the ratio 4:4:1. What is the overall unit contribution margin for JJ Manufacturing with their current product mix?

EB12. LO 3.4 JJ Manufacturing builds and sells switch harnesses for glove boxes. The sales price and variable cost for each follows:

Product	Selling price per unit	Variable cost per unit
Trunk switch	$60.00	$28.00
Gas door switch	$75.00	$33.00
Glove box light	$40.00	$22.00

Their sales mix is reflected in the ratio 4:4:1. If annual fixed costs shared by the three products are $18,840 how many units of each product will need to be sold in order for JJ to break even?

EB13. LO 3.4 Use the information from the previous exercises involving JJ Manufacturing to determine their break-even point in sales dollars.

EB14. LO 3.5 Company A has current sales of $4,000,000 and a 45% contribution margin. Its fixed costs are $600,000. Company B is a service firm with current service revenue of $2,800,000 and a 15% contribution margin. Company B's fixed costs are $375,000. Compute the degree of operating leverage for both companies. Which company will benefit most from a 15% increase in sales? Explain why.

EB15. LO 3.5 Best Wholesale recently calculated their break-even point for their Midwest operations. The national sales manager has asked them to include a $10,500 margin of safety in their calculations. Using the following information, recalculate Best Wholesale's break-even point in units and dollars with the $10,500 margin of safety included.

	Current
Units sold	1,200
Sales price per unit	$ 750
Variable cost per unit	$ 575
Contribution margin per unit	$ 175
Fixed costs	$ 96,250
Break-even (in units)	550
Contribution margin ratio	23.33%
Break-even (in dollars)	$412,500

Problem Set A

PA1. LO 3.1 A company sells small motors as a component part to automobiles. The Model 101 motor sells for $850 and has per-unit variable costs of $400 associated with its production. The company has fixed expenses of $90,000 per month. In August, the company sold 425 of the Model 101 motors.

A. Calculate the contribution margin per unit for the Model 101.
B. Calculate the contribution margin ratio of the Model 101.
C. Prepare a contribution margin income statement for the month of August.

PA2. LO 3.1 A company manufactures and sells racing bicycles to specialty retailers. The Bomber model sells for $450 and has per-unit variable costs of $200 associated with its production. The company has fixed expenses of $40,000 per month. In May, the company sold 225 of the Bomber model bikes.

A. Calculate the contribution margin per unit for the Bomber.
B. Calculate the contribution margin ratio of the Bomber.
C. Prepare a contribution margin income statement for the month of May.

PA3. LO 3.2 Fill in the missing amounts for the four companies. Each case is independent of the others. Assume that only one product is being sold by each company.

	Company A	Company B	Company C	Company D
Units sold	600	?	?	900
Sales in dollars	$30,000	$70,000	$240,000	?
Total variable expenses	$ 7,200	?	?	$144,000
Per unit C/M	?	$ 80	$ 270	$ 140
Total fixed expenses	$20,000	$50,000	$145,000	?
Net operating income (loss)	?	$ 6,000	$ (10,000)	$ (24,000)

PA4. LO 3.2 Markham Farms reports the following contribution margin income statement for the month of August. The company has the opportunity to purchase new machinery that will reduce its variable cost per unit by $2 but will increase fixed costs by 15%. Prepare a projected contribution margin income statement for Markham Farm assuming it purchases the new equipment. Assume sales level remains unchanged.

MARKHAM FARMS
Contribution Margin Income Statement
For Year Ended December 31, 2019

Sales (1,500 units at $75 per unit)	$112,500
Variable costs (1,500 units at $15 per unit)	22,500
Contribution margin	90,000
Fixed cost	40,000
Net income (loss)	$ 50,000

PA5. LO 3.3 Kylie's Cookies is considering the purchase of a larger oven that will cost $2,200 and will increase her fixed costs by $59. What would happen if she purchased the new oven to realize the variable cost savings of $0.10 per cookie, and what would happen if she raised her price by just $0.20? She feels confident that such a small price increase will decrease the sales by only 25 units and may help her offset the increase in fixed costs. Given the following current prices how would the break-even in units and dollars change if she doesn't increase the selling price and if she does increase the selling price? Complete the monthly contribution margin income statement for each of these cases.

Selling price, variable cost, and fixed cost change analysis			
	With Current Price	**With decreased VC and increased FC**	**With increased SP, decreased VC, and increased FC**
Sales price per unit	$1.75		
Variable cost per unit	0.40		
Contribution margin per unit	$1.35		
Fixed costs	$ 405		
Break-even in units	300		
Break-even in dollars	$ 525		
Monthly contribution margin income statement			
Unit sales, expected	800		
Sales			
Variable costs			
Contribution margin			
Fixed costs			
Net income			

PA6. LO 3.4 Morris Industries manufactures and sells three products (AA, BB, and CC). The sales price and unit variable cost for the three products are as follows:

Product	Sales Price per Unit	Variable Cost per Unit
AA	$50	$30
BB	40	15
CC	30	10

Their sales mix is reflected as a ratio of 5:3:2. Annual fixed costs shared by the three products are $258,000 per year.

A. What are total variable costs for Morris with their current product mix?
B. Calculate the number of units of each product that will need to be sold in order for Morris to break even.
C. What is their break-even point in sales dollars?
D. Using an income statement format, prove that this is the break-even point.

PA7. LO 3.4 Manatoah Manufacturing produces 3 models of window air conditioners: model 101, model 201, and model 301. The sales price and variable costs for these three models are as follows:

Product	Sales Price per Unit	Variable Cost per Unit
Model 101	$275	$185
Model 201	350	215
Model 301	400	245

The current product mix is 4:3:2. The three models share total fixed costs of $430,000.

A. Calculate the sales price per composite unit.
B. What is the contribution margin per composite unit?
C. Calculate Manatoah's break-even point in both dollars and units.
D. Using an income statement format, prove that this is the break-even point.

PA8. LO 3.5 Jakarta Company is a service firm with current service revenue of $400,000 and a 40% contribution margin. Its fixed costs are $80,000. Maldives Company has current sales of $6,610,000 and a 45% contribution margin. Its fixed costs are $1,800,000.

A. What is the margin of safety for Jakarta and Maldives?
B. Compare the margin of safety in dollars between the two companies. Which is stronger?
C. Compare the margin of safety in percentage between the two companies. Now, which one is stronger?
D. Compute the degree of operating leverage for both companies. Which company will benefit most from a 15% increase in sales? Explain why. Illustrate your findings in an Income Statement that is increased by 15%.

Problem Set B

PB1. LO 3.1 A company sells mulch by the cubic yard. Grade A much sells for $150 per cubic yard and has variable costs of $65 per cubic yard. The company has fixed expenses of $15,000 per month. In August, the company sold 240 cubic yards of Grade A mulch.

A. Calculate the contribution margin per unit for Grade A mulch.
B. Calculate the contribution margin ratio of the Grade A mulch.
C. Prepare a contribution margin income statement for the month of August.

PB2. LO 3.1 A company manufactures and sells blades that are used in riding lawnmowers. The 18-inch blade sells for $15 and has per-unit variable costs of $4 associated with its production. The company has fixed expenses of $85,000 per month. In January, the company sold 12,000 of the 18-inch blades.

A. Calculate the contribution margin per unit for the 18-inch blade.
B. Calculate the contribution margin ratio of the 18-inch blade.
C. Prepare a contribution margin income statement for the month of January.

PB3. LO 3.2 Fill in the missing amounts for the four companies. Each case is independent of the others. Assume that only one product is being sold by each company.

	Company A	Company B	Company C	Company D
Units sold	700	?	?	600
Sales in dollars	$35,000	$40,000	$35,000	?
Total variable expenses	$14,000	?	?	$18,000
Per unit C/M	?	$ 90	$ 100	$ 60
Total fixed expenses	$10,000	$ 9,000	$12,000	?
Net operating income (loss)	?	$27,000	$ 8,000	$16,000

PB4. LO 3.2 West Island distributes a single product. The company's sales and expenses for the month of June are shown.

Sales price per unit	$ 150
Variable costs per unit	80
Fixed expenses	42,000

Using the information presented, answer these questions:

A. What is the break-even point in units sold and dollar sales?
B. What is the total contribution margin at the break-even point?
C. If West Island wants to earn a profit of $21,000, how many units would they have to sell?
D. Prepare a contribution margin income statement that reflects sales necessary to achieve the target profit.

PB5. LO 3.2 Wellington, Inc., reports the following contribution margin income statement for the month of May. The company has the opportunity to purchase new machinery that will reduce its variable cost per unit by $10 but will increase fixed costs by 20%. Prepare a projected contribution margin income statement for Wellington, Inc., assuming it purchases the new equipment. Assume sales level remains unchanged.

WELLINGTON, INC.
Contribution Margin Income Statement
For Year Ended December 31, 2019

Sales (800 units at $225 per unit)	$180,000
Variable costs (800 units at $120 per unit)	96,000
Contribution margin	84,000
Fixed cost	35,000
Net income (loss)	$ 49,000

PB6. LO 3.3 Karen's Quilts is considering the purchase of a new Long-arm Quilt Machine that will cost $17,500 and will increase her fixed costs by $119. What would happen if she purchased the new quilt machine to realize the variable cost savings of $5.00 per quilt, and what would happen if she raised her price by just $5.00? She feels confident that such a small price increase will not decrease the sales in units that will help her offset the increase in fixed costs. Given the following current prices how would the break-even in units and dollars change? Complete the monthly contribution margin income statement for each of these cases.

Selling Price, Variable Cost and Fixed Cost Change Analysis			
	With Current Price	**With Decreased VC and Increased FC**	**With Increased SP, Decreased VC and Increased FC**
Sales price per unit	$ 65.00		
Variable cost per unit	15.50		
Contribution margin per unit	$ 49.50		
Fixed costs	$ 99.00		
Break-even in units	2		
Break-even in dollars	$130.00		
Monthly Contribution Margin Income Statement			
Unit sales, expected	10	10	10
Sales			
Variable costs			
Contribution margin			
Fixed costs			
Net income			

PB7. LO 3.4 Abilene Industries manufactures and sells three products (XX, YY, and ZZ). The sales price and unit variable cost for the three products are as follows:

Product	Sales Price per Unit	Variable Cost per Unit
XX	$75	$45
YY	60	25
ZZ	55	15

Their sales mix is reflected as a ratio of 4:2:1. Annual fixed costs shared by the three products are $345,000 per year.

A. What are total variable costs for Abilene with their current product mix?
B. Calculate the number of units of each product that will need to be sold in order for Abilene to break even.
C. What is their break-even point in sales dollars?
D. Using an income statement format, prove that this is the break-even point.

PB8. LO 3.4 Tim-Buck-II rents jet skis at a beach resort. There are three models available to rent: Junior, Adult, and Expert. The rental price and variable costs for these three models are as follows:

Product	Sales Price per Unit	Variable Cost per Unit
Junior	$ 50	$15
Adult	75	25
Expert	110	60

The current product mix is 5:4:1. The three models share total fixed costs of $114,750

A. Calculate the sales price per composite unit.
B. What is the contribution margin per composite unit?
C. Calculate Tim-Buck-II's break-even point in both dollars and units.
D. Using an income statement format, prove that this is the break-even point.

PB9. LO 3.5 Fire Company is a service firm with current service revenue of $900,000 and a 40% contribution margin. Its fixed costs are $200,000. Ice Company has current sales of $420,000 and a 30% contribution margin. Its fixed costs are $90,000.

A. What is the margin of safety for Fire and Ice?
B. Compare the margin of safety in dollars between the two companies. Which is stronger?
C. Compare the margin of safety in percentage between the two companies. Now which one is stronger?
D. Compute the degree of operating leverage for both companies. Which company will benefit most from a 10% increase in sales? Explain why. Illustrate your findings in an Income Statement that is increased by 10%.

Thought Provokers

TP1. LO 3.1 Mariana Manufacturing and Bellow Brothers compete in the same industry and in all respects their products are virtually identical. However, most of Mariana's costs are fixed while Bellow's costs are primarily variable. If sales increase for both companies, which will realize the greatest increase in profits? Why?

TP2. LO 3.2 Roald is the sales manager for a small regional manufacturing firm you own. You have asked him to put together a plan for expanding into nearby markets. You know that Roald's previous job had him working closely with many of your competitors in this new market, and you believe he will be able to facilitate the company expansion. He is to prepare a presentation to you and your partners outlining his strategy for taking the company into this expanded market. The day before the presentation, Roald comes to you and explains that he will not be making a presentation on market expansion but instead wants to discuss several ways he believes the company can reduce both fixed and variable costs. Why would Roald want to focus on reducing costs rather than on expanding into a new market?

TP3. LO 3.3 As a manager, you have to choose between two options for new production equipment. Machine A will increase fixed costs by a substantial margin but will produce greater sales volume at the current price. Machine B will only slightly increase fixed costs but will produce considerable savings on variable cost per unit. No additional sales are anticipated if Machine B is selected. What are the relative merits of both machines, and how could you go about analyzing which machine is the better investment for the company in terms of both net operating income and break-even?

TP4. LO 3.5 Couture's Creations is considering offering Joe, an hourly employee, the opportunity to become a salaried employee. Why is this a good idea for Couture's Creations? Is this a good idea for Joe? What if Couture's Creations entices Joe to agree to the change by offering him a salaried position with no risk of layoff during the winter lull? What if Joe agrees and Couture's Creations lays him off anyway six months into the agreement?