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FINANCIAL & MANAGERIAL ACCOUNTING

SEGMENT -06,07,08

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Chapter Two

LEARNING OBJECTIVES

Cost Terms, Concepts, and Classifications

After studying Chapter 2, you should be able to:

1. Identify and give examples of each of the three basic manufacturing cost categories.
2. Distinguish between product costs and period costs and give examples of each.
3. Prepare an income statement including calculation of the cost of goods sold.
4. Prepare a schedule of cost of goods manufactured.
5. Understand the differences between variable costs and fixed costs.
6. Understand the differences between direct and indirect costs.
7. Define and give examples of cost classifications used in making decisions: differential costs, opportunity costs, and sunk costs.
8. (Appendix 2A) Properly account for labor costs associated with idle time, overtime, and fringe benefits.
9. (Appendix 2B) Identify the four types of quality costs and explain how they interact.
10. (Appendix 2B) Prepare and interpret a quality cost report.

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The Services Banks Offer the Public

Banks are financial service firms, producing and selling professional management of the public's funds and performing many other roles in the economy. (See Table 1-1.) Their success hinges on their ability to identify the financial services the public demands, produce those services efficiently, and sell them at a competitive price. And what services does the public demand from banks today? In this section, we present an overview of banking's *service menu*.

Services Banks Have Offered Throughout History

Currency exchange
The service offered by banks in which they trade one nation's currency for that of another.

Carrying Out Currency Exchanges. History shows that one of the first services offered by banks was currency exchange. A bank stood ready to trade one form of currency, such as dollars, for another, such as francs or pesos, in return for a service fee. Such exchanges were important to travelers in the ancient world, as they are today, because the travelers' survival and comfort depended on gaining access to the local currency of the country or city through which they were journeying. In today's financial marketplace,

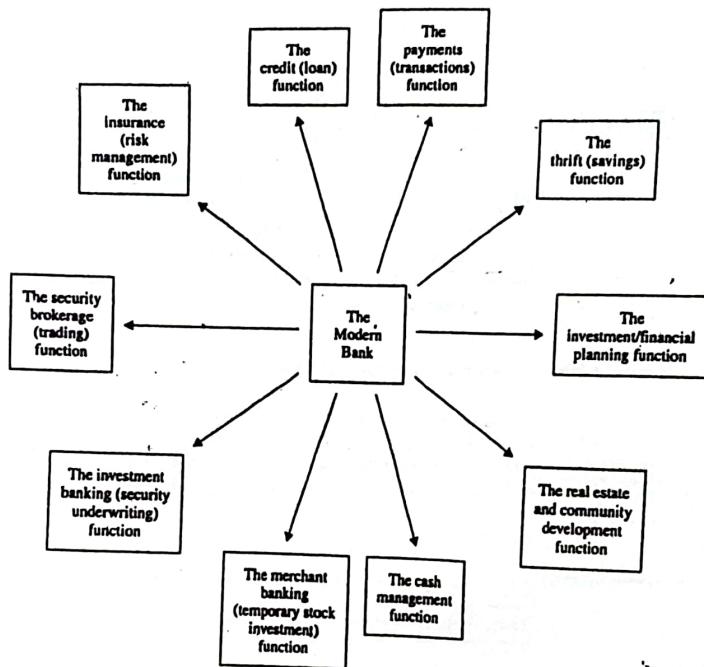
TABLE 1-1 The Many Different Roles Banks Play in the Economy

While many people believe that banks play only a narrow role in the economy—taking deposits and making loans—the modern bank has had to adopt new roles to remain competitive and responsive to public needs. Banking's principal roles today are as follows:

The intermediation role	Transforming savings received primarily from households into credit (loans) for business firms and others in order to make investments in new buildings, equipment, and other goals
The payments role	Carrying out payments for goods and services on behalf of their customers (such as by issuing and clearing checks, wiring funds, providing a conduit for electronic payments; and dispensing currency and coins).
The guarantor role	Standing behind their customers to pay off customer debts when those customers are unable to pay (such as by issuing letters of credit).
The risk management role	Assisting customers in preparing financially for the risk of loss to property and persons.
The savings/investment advisor role	Aiding customers in fulfilling their long-range goals for a better life by building, managing, and protecting savings.
The safekeeping/certification of value role	Safeguarding a customer's valuables and appraising and certifying their true market value.
The agency role	Acting on behalf of customers to manage and protect their property or issue and redeem their securities (usually provided through the bank's trust department).
The policy role	Serving as a conduit for government policy in attempting to regulate the growth of the economy and pursue social goals.

institutions that offer the widest range of financial services—especially credit, savings, and payments services—and perform the widest range of financial functions of any business firm in the economy. This multiplicity of bank services and functions has led to banks being labeled "financial department stores" and to such familiar advertising slogans as "Your Bank—a Full-Service Financial Institution" (see Exhibit 1-2).

EXHIBIT 1-2
Service Areas in the Modern Bank



Concept Checks

- 1-1. What is a *bank*?
- 1-2. Under current U.S. federal law, what must a corporation do to qualify as a *commercial bank*?
- 1-3. Why are banks increasingly reaching out to become one-stop financial service conglomerates? Is this a good idea, in your opinion?

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As explained in Chapter 1, the work of management focuses on (1) planning, which includes setting objectives and outlining how to attain these objectives; and (2) control, which includes the steps to take to ensure that objectives are realized. To carry out these planning and control responsibilities, managers need information about the organization. From an accounting point of view, this information often relates to the costs of the organization.

In managerial accounting, the term *cost* is used in many different ways. The reason is that there are many types of costs, and these costs are classified differently according to the immediate needs of management. For example, managers may want cost data to prepare external financial reports, to prepare planning budgets, or to make decisions. Each different use of cost data demands a different classification and definition of costs. For example, the preparation of external financial reports requires the use of historical cost data, whereas decision making may require predictions about future costs.

In this chapter, we discuss many of the possible uses of cost data and how costs are defined and classified for each use. Our first task is to explain how costs are classified for the purpose of preparing external financial reports—particularly in manufacturing companies. To set the stage for this discussion, we begin the chapter by defining some terms commonly used in manufacturing.

General Cost Classifications

Costs are associated with all types of organizations—business, nonbusiness, manufacturing, retail, and service. Generally, the kinds of costs that are incurred and the way in which these costs are classified depends on the type of organization involved. Managerial accounting is as applicable to one type of organization as to another. For this reason, we will consider in our discussion the cost characteristics of a variety of organizations—manufacturing, merchandising, and service.

Our initial focus in this chapter is on manufacturing companies, since their basic activities include most of the activities found in other types of business organizations. Manufacturing companies such as Texas Instruments, Ford, and Kodak are involved in acquiring raw materials, producing finished goods, marketing, distributing, billing, and almost every other business activity. Therefore, an understanding of costs in a manufacturing company can be very helpful in understanding costs in other types of organizations.

In this chapter, we develop cost concepts that apply to diverse organizations. For example, these cost concepts apply to fast-food outlets such as Kentucky Fried Chicken, Pizza Hut, and Taco Bell; movie studios such as Disney, Paramount, and United Artists; consulting firms such as Andersen Consulting and McKinsey; and your local hospital. The exact terms used in these industries may not be the same as those used in manufacturing, but the same basic concepts apply. With some slight modifications, these basic concepts also apply to merchandising companies such as Wal-Mart, The Gap, 7-Eleven, Nordstrom, and Tower Records that resell finished goods acquired from manufacturers and other sources. With that in mind, let us begin our discussion of manufacturing costs.



Concept 2-1

LEARNING OBJECTIVE 1
Identify and give examples of
each of the three basic
manufacturing cost categories.

Manufacturing Costs

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

Direct Materials The materials that go into the final product are called raw materials. This term is somewhat misleading, since it seems to imply unprocessed natural resources like wood pulp or iron ore. Actually, raw materials refer to any materials that are

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used in the final product; and the finished product of one company can become the raw materials of another company. For example, the plastics produced by DuPont are a raw material used by Compaq Computer in its personal computers. One study of 37 manufacturing industries found that materials costs averaged about 55% of sales revenues.¹

Direct materials are those materials that become an integral part of the finished product and that can be physically and conveniently traced to it. This would include, for example, the seats Boeing purchases from subcontractors to install in its commercial aircraft. Also included is the tiny electric motor Panasonic uses in its CD players to make the CD spin.

Sometimes it isn't worth the effort to trace the costs of relatively insignificant materials to the end products. Such minor items would include the solder used to make electrical connections in a Sony TV or the glue used to assemble an Ethan Allen chair. Materials such as solder and glue are called **indirect materials** and are included as part of manufacturing overhead, which is discussed later in this section.

Direct Labor The term **direct labor** is reserved for those labor costs that can be easily (i.e., physically and conveniently) traced to individual units of product. Direct labor is sometimes called *touch labor*, since direct labor workers typically touch the product while it is being made. The labor costs of assembly-line workers, for example, would be direct labor costs, as would the labor costs of carpenters, bricklayers, and machine operators.

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

In some industries, major shifts are taking place in the structure of labor costs. Sophisticated automated equipment, run and maintained by skilled indirect workers, is increasingly replacing direct labor. Indeed, in the study cited above of 37 manufacturing industries, direct labor averaged only about 10% of sales revenues. In a few companies, direct labor has become such a minor element of cost that it has disappeared altogether as a separate cost category. More is said in later chapters about this trend and about the impact it is having on cost systems. However, the vast majority of manufacturing and service companies throughout the world continue to recognize direct labor as a separate cost category.

Manufacturing Overhead **Manufacturing overhead**, the third element of manufacturing cost, includes all costs of manufacturing except direct materials and direct labor. Manufacturing overhead includes items such as indirect materials; indirect labor; maintenance and repairs on production equipment; and heat and light, property taxes, depreciation, and insurance on manufacturing facilities. A company also incurs costs for heat and light, property taxes, insurance, depreciation, and so forth, associated with its selling and administrative functions, but these costs are not included as part of manufacturing overhead. Only those costs associated with *operating the factory* are included in the manufacturing overhead category. Several studies have found that manufacturing overhead averages about 16% of sales revenues.²

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

¹ Germain Boer and Debra Jeter, "What's New About Modern Manufacturing? Empirical Evidence on Manufacturing Cost Changes," *Journal of Management Accounting Research*, Fall 1993, pp. 61-83.

² J. Miller, A. DeMeyer, and J. Nakao, *Benchmarking Global Manufacturing* (Homewood, IL: Richard D. Irwin), 1992, Chapter 2. The Boer and Jeter article cited above contains a similar finding concerning the magnitude of manufacturing overhead.

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Manufacturing overhead combined with direct labor is called **conversion cost**. This term stems from the fact that direct labor costs and overhead costs are incurred to convert materials into finished products. Direct labor combined with direct materials is called **prime cost**.

Nonmanufacturing Costs

Generally, nonmanufacturing costs are subclassified into two categories.

- 1 Marketing or selling costs
- 2 Administrative costs

Marketing or selling costs include all costs necessary to secure customer orders and get the finished product into the hands of the customer. These costs are often called *order-getting and order-filling costs*. Examples of marketing costs include advertising, shipping, sales travel, sales commissions, sales salaries, and costs of finished goods warehouses.

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

In Business

Why Is Tuition So High?



Do you ever wonder why tuition costs are so high? Administrative costs can be crushing. *Forbes* magazine reports that an average of 2.5 administrators are employed for each faculty member in public colleges and 1.9 in private colleges. The worst case is Mississippi, which has four administrators for every teacher. The best case found in public colleges is Colorado, which "manages to get by with just under two administrators per teacher." Much of the administrative work results from "the mandates that accompany federal money, such as affirmative action, and the personnel needed to monitor compliance with those mandates."

Source: Peter Brimelow, "The Paper Chase," *Forbes*, May 17, 1999, pp. 78-79.

Product Costs versus Period Costs

LEARNING OBJECTIVE 2

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

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

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

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

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Dissecting the Value Chain

United Colors of Benetton, an Italian apparel company headquartered in Ponzano, is unusual in that it is involved in all activities in the "value chain" from clothing design through manufacturing, distribution, and ultimate sale to customers in Benetton retail outlets. Most companies are involved in only one or two of these activities. Looking at this company allows us to see how costs are distributed across the entire value chain. A recent income statement from the company contained the following data:

	Billions of Italian Lire	Percent of Net Sales
Net sales	<u>2,760</u>	100.0%
Cost of sales	<u>1,721</u>	62.2
Selling and general and administrative expenses:		
Payroll and related cost	166	6.0
Distribution and transport	57	2.1
Sales commissions	115	4.2
Advertising and promotion	120	4.3
Depreciation and amortization	42	1.5
Other expenses	<u>275</u>	9.0
Total selling and general and administrative expenses	<u>775</u>	28.0%

Even though this company spends large sums on advertising and runs its own shops, the cost of sales is still quite high in relation to the net sales—62% of net sales. And despite the company's lavish advertising campaigns, advertising and promotion costs amounted to only a little over 4% of net sales. (Note: One U.S. dollar was worth about 1,600 Italian lire at the time of this financial report.)

Product Costs

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

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

Period Costs

Period costs are all the costs that are not included in product costs. These costs are expensed on the income statement in the period in which they are incurred, using the usual rules of accrual accounting you have already learned in financial accounting. Period costs are not included as part of the cost of either purchased or manufactured goods. Sales commissions and office rent are good examples of period costs. Neither commissions nor office rent are included as part of the cost of purchased or manufactured goods. Rather,

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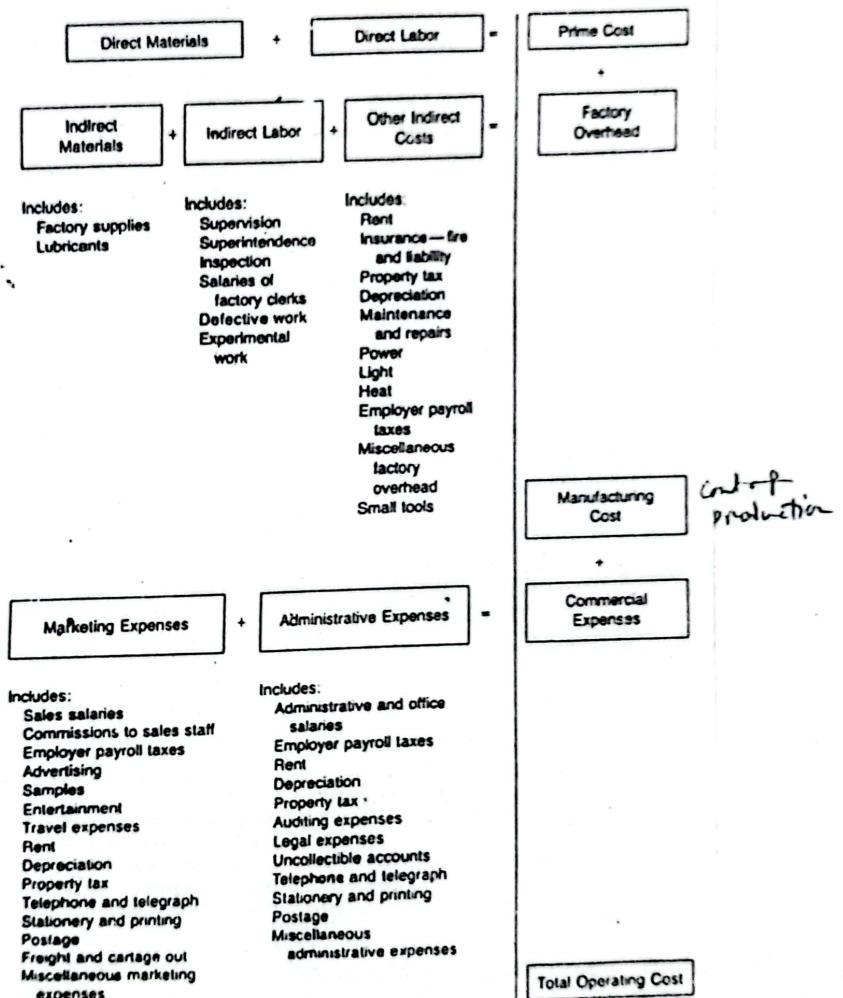
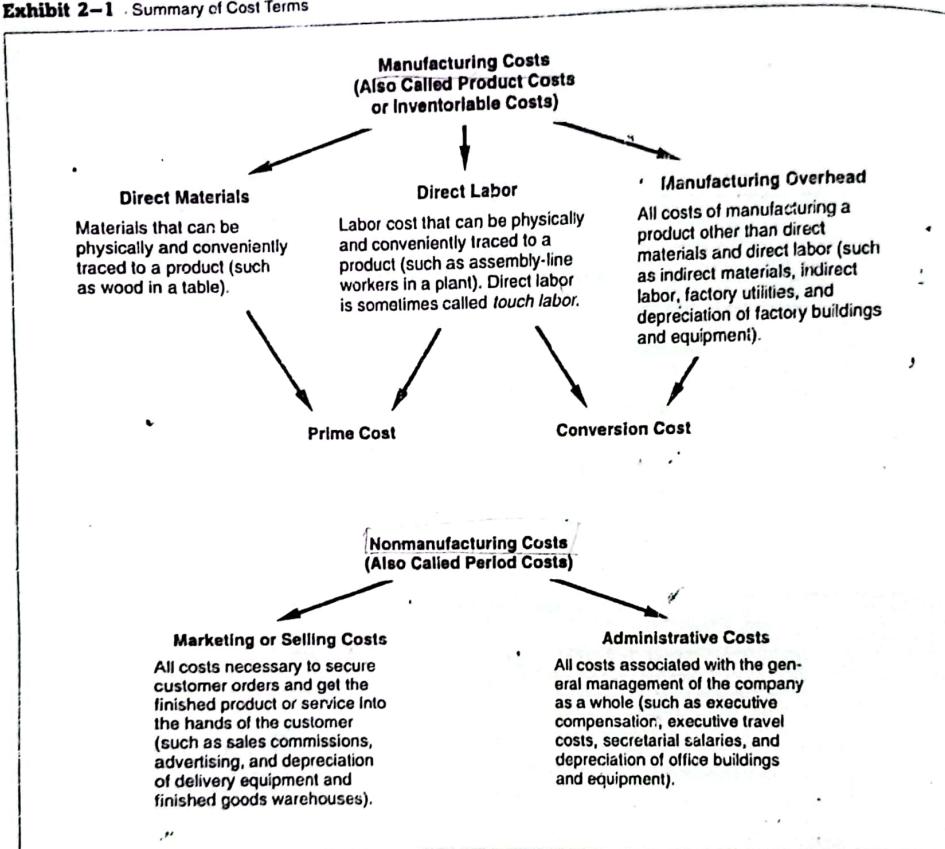


Exhibit 2-1 Summary of Cost Terms



both items are treated as expenses on the income statement in the period in which they are incurred. Thus, they are said to be period costs.

As suggested above, *all selling and administrative expenses are considered to be period costs*. Therefore, advertising, executive salaries, sales commissions, public relations, and other nonmanufacturing costs discussed earlier would all be period costs. They will appear on the income statement as expenses in the period in which they are incurred.

Exhibit 2-1 contains a summary of the cost terms that we have introduced so far.

Cost Classifications on Financial Statements

In your prior accounting training, you learned that firms prepare periodic financial reports for creditors, stockholders, and others to show the financial condition of the firm and the

Exhibit 2-7
Summary of Cost Classifications

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

Cost Classifications for Predicting Cost Behavior

LEARNING OBJECTIVE 5
Understand the differences between variable costs and fixed costs.

Quite frequently, it is necessary to predict how a certain cost will behave in response to a change in activity. For example, a manager at AT&T may want to estimate the impact a 5% increase in long-distance calls would have on the company's total electric bill or on the total wages the company pays its long-distance operators. **Cost behavior** refers to how a cost will react or respond to changes in the level of business activity. As the activity level rises and falls, a particular cost may rise and fall as well—or it may remain constant. For planning purposes, a manager must be able to anticipate which of these will happen; and if a cost can be expected to change, the manager must know by how much it will change. To help make such distinctions, costs are often categorized as variable or fixed.

Variable Cost

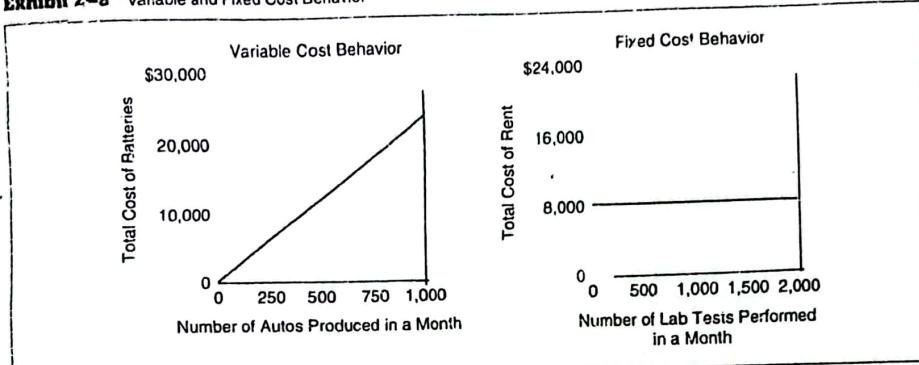
A **variable cost** is a cost that varies, in total, in direct proportion to changes in the level of activity. The activity can be expressed in many ways, such as units produced, units sold, miles driven, beds occupied, lines of print, hours worked, and so forth. A good example of a variable cost is direct materials. The cost of direct materials used during a period will vary, in total, in direct proportion to the number of units that are produced. To illustrate this idea, consider the Saturn Division of GM. Each auto requires one battery. As the output of autos increases and decreases, the number of batteries used will increase and decrease proportionately. If auto production goes up 10%, then the number of batteries used will also go up 10%. The concept of a variable cost is shown in graphic form in Exhibit 2-8.

It is important to note that when we speak of a cost as being variable, we mean the **total cost** rises and falls as the activity level rises and falls. This idea is presented below, assuming that a Saturn's battery costs \$24:

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Exhibit 2-8 Variable and Fixed Cost Behavior



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

One interesting aspect of variable cost behavior is that a variable cost is constant if expressed on a *per unit* basis. Observe from the tabulation above that the per unit cost of batteries remains constant at \$24 even though the total cost of the batteries increases and decreases with activity.

There are many examples of costs that are variable with respect to the products and services provided by a company. In a manufacturing company, variable costs include items such as direct materials and some elements of manufacturing overhead such as lubricants, shipping costs, and sales commissions. For the present we will also assume that direct labor is a variable cost, although as we shall see in Chapter 6, direct labor may act more like a fixed cost in many situations. In a merchandising company, variable costs include items such as cost of goods sold, commissions to salespersons, and billing costs. In a hospital, the variable costs of providing health care services to patients would include the costs of the supplies, drugs, meals, and perhaps nursing services.

When we say that a cost is variable, we ordinarily mean that it is variable with respect to the amount of goods or services the organization produces. However, costs can be variable with respect to other things. For example, the wages paid to employees at a Blockbuster Video outlet will depend on the number of hours the store is open and not strictly on the number of videos rented. In this case, we would say that wage costs are variable with respect to the hours of operation. Nevertheless, when we say that a cost is variable, we ordinarily mean it is variable with respect to the amount of goods and services produced. This could be how many Jeep Cherokees are produced, how many videos are rented, how many patients are treated, and so on.

Fixed Cost

A **fixed cost** is a cost that remains constant, in total, regardless of changes in the level of activity. Unlike variable costs, fixed costs are not affected by changes in activity. Consequently, as the activity level rises and falls, the fixed costs remain constant in total amount unless influenced by some outside force, such as a price change. Rent is a good example

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S of a fixed cost. Suppose the Mayo Clinic rents a machine for \$8,000 per month that tests blood samples for the presence of leukemia cells. The \$8,000 monthly rental cost will be sustained regardless of the number of tests that may be performed during the month. The concept of a fixed cost is shown in graphic form in Exhibit 2-8.

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

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

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

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

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

A summary of both variable and fixed cost behavior is presented in Exhibit 2-9.

In Business

The Cost of a Call

Variable costs in some industries can be very low relative to fixed costs. For example, costs in the telecommunications industry are almost all fixed. The cost of physically transporting a call is now only about 7% of what customers pay and it costs more for the telephone company to bill for the call than it costs the telephone company to actually make the call.

Source: Scott Wooley, "Meltdown," *Forbes* July 3, 2000, pp. 70-71.

Exhibit 2-9

Summary of Variable and Fixed Cost Behavior

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

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Cost Classifications for Assigning Costs to Cost Objects

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

LEARNING OBJECTIVE 6

Understand the differences between direct and indirect costs.

Direct Cost

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

Indirect Cost

An **indirect cost** is a cost that cannot be easily and conveniently traced to the particular cost object under consideration. For example, a Campbell Soup factory may produce dozens of varieties of canned soups. The factory manager's salary would be an indirect cost of a particular variety such as chicken noodle soup. The reason is that the factory manager's salary is not caused by any one variety of soup but rather is incurred as a consequence of running the entire factory. *To be traced to a cost object such as a particular product, the cost must be caused by the cost object.* The factory manager's salary is called a **common cost** of producing the various products of the factory. A **common cost** is a cost that is incurred to support a number of costing objects but cannot be traced to them individually. A common cost is a particular type of indirect cost.

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

Cost Classifications for Decision Making

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

LEARNING OBJECTIVE 7

Define and give examples of cost classifications used in making decisions: differential costs, opportunity costs, and sunk costs.

Differential Cost and Revenue

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

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

The accountant's differential cost concept can be compared to the economist's marginal cost concept. In speaking of changes in cost and revenue, the economist employs the terms *marginal cost* and *marginal revenue*. The revenue that can be obtained from selling

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one more unit of product is called marginal revenue, and the cost involved in producing one more unit of product is called marginal cost. The economist's marginal concept is basically the same as the accountant's differential concept applied to a single unit of output.

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

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

V = Variable; F = Fixed.

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

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

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

In Business

Using Those Empty Seats



Many corporate jets fly with only one or two executives on board. Priscilla Bium wondered why some of the empty seats couldn't be used to fly cancer patients who need specialized treatment outside their home area. Flying on a regular commercial airline can be an expensive and grueling experience for cancer patients. Taking the initiative, she helped found the Corporate Angel Network, an organization that arranges free flights on some 1,500 jets from over 500 companies. Since the jets fly anyway, filling a seat with a cancer patient doesn't involve any significant incremental cost for the companies that donate the service. Since its founding in 1981, the Corporate Angel Network has arranged over 14,000 free flights.

Source: Scott McCormack, "Waste Not, Want Not," *Forbes*, July 26, 1999, p. 118.

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Opportunity Cost

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

Example 1

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

Example 2

Suppose that Neiman Marcus is considering investing a large sum of money in land that may be a site for a future store. Rather than invest the funds in land, the company could invest the funds in high-grade securities. If the land is acquired, the opportunity cost will be the investment income that could have been realized if the securities had been purchased instead.

Example 3

Steve is employed with a company that pays him a salary of \$30,000 per year. He is thinking about leaving the company and returning to school. Since returning to school would require that he give up his \$30,000 salary, the forgone salary would be an opportunity cost of seeking further education.

Opportunity cost is not usually entered in the accounting records of an organization, but it is a cost that must be explicitly considered in every decision a manager makes. Virtually every alternative has some opportunity cost attached to it. In example 3 above, for instance, if Steve decides to stay at his job, there still is an opportunity cost involved: It is the greater income that could be realized in future years as a result of returning to school.

Sunk Cost

A **sunk cost** is a cost that has already been incurred and that cannot be changed by any decision made now or in the future. Since sunk costs cannot be changed by any decision, they are not differential costs. Therefore, they can and should be ignored when making a decision.

To illustrate a sunk cost, assume that a company paid \$50,000 several years ago for a special-purpose machine. The machine was used to make a product that is now obsolete and is no longer being sold. Even though in hindsight the purchase of the machine may have been unwise, no amount of regret can undo that decision. And it would be folly to continue making the obsolete product in a misguided attempt to "recover" the original cost of the machine. In short, the \$50,000 originally paid for the machine has already been incurred and cannot be a differential cost in any future decision. For this reason, such costs are said to be sunk and should be ignored in decisions.

Summary

In this chapter, we have looked at some of the ways in which managers classify costs. How the costs will be used—for preparing external reports, predicting cost behavior, assigning costs to cost objects, or decision making—will dictate how the costs will be classified.

For purposes of valuing inventories and determining expenses for the balance sheet and income statement, costs are classified as either product costs or period costs. Product costs are assigned to inventories and are considered assets until the products are sold. At the point of sale, product costs become cost of goods sold on the income statement. In contrast, following the usual accrual practices, period costs are taken directly to the income statement as expenses in the period in which they are incurred.

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

For purposes of predicting cost behavior—how costs will react to changes in activity—managers commonly classify costs into two categories—variable and fixed. Variable costs, in total, are strictly proportional to activity. Thus, the variable cost per unit is constant. Fixed costs, in total, remain at the same level for changes in activity that occur within the relevant range. Thus, the average fixed cost per unit decreases as the number of units increases.

For purposes of assigning costs to cost objects such as products or departments, costs are classified as direct or indirect. Direct costs can be conveniently traced to the cost objects. Indirect costs cannot be conveniently traced to cost objects.

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

These various cost classifications are *different* ways of looking at costs. A particular cost, such as the cost of cheese in a taco served at Taco Bell, could be a manufacturing cost, a product cost, a variable cost, a direct cost, and a differential cost—all at the same time. Taco Bell can be considered to be a manufacturer of fast food. The cost of the cheese in a taco would be considered a manufacturing cost and, as such, it would be a product cost as well. In addition, the cost of cheese would be considered variable with respect to the number of tacos served and would be a direct cost of serving tacos. Finally, the cost of the cheese in a taco would be considered a differential cost of the taco.

Review Problem 1: Cost Terms

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

1. The tables are made of wood that costs \$100 per table.
2. The tables are assembled by workers at a wage cost of \$40 per table.
3. Workers assembling the tables are supervised by a factory supervisor who is paid \$25,000 per year.
4. Electrical costs are \$2 per machine-hour. Four machine-hours are required to produce a table.
5. The depreciation cost of the machines used to make the tables totals \$10,000 per year.
6. The salary of the president of Porter Company is \$100,000 per year.
7. Porter Company spends \$250,000 per year to advertise its products.
8. Salespersons are paid a commission of \$30 for each table sold.
9. Instead of producing the tables, Porter Company could rent its factory space out at a rental income of \$50,000 per year.

Required:

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

Solution to Review Problem 1

Variable Cost	Fixed Cost	(Selling and Administrative) Cost	Period			Product Cost		To Units of Product		Opportunity Cost
			Direct Materials	Direct Labor	Manufacturing Overhead	Direct	Indirect	Sunk Cost	Opportunity Cost	
1. Wood used in a table (\$100 per table).....	X		X					X		
2. Labor cost to assemble a table (\$40 per table)....	X			X				X		

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	Variable Cost	Fixed Cost	(Selling and administrative) Cost	Period			Product Cost			To Units of Product		Sunk Cost	Opportunity Cost
				Direct Materials	Direct Labor	Manufacturing Overhead	Direct	Indirect					
3. Salary of the factory supervisor (\$25,000 per year)		X					X				X		
4. Cost of electricity to produce tables (\$2 per machine-hour)		X											
5. Depreciation of machines used to produce tables (\$10,000 per year)		X					X				X		
6. Salary of the company president (\$100,000 per year)		X					X			X		X*	
7. Advertising expense (\$250,000 per year)	X	X											
8. Commissions paid to salespersons (\$30 per table sold)	X	X											
9. Rental income forgone on factory space.	X		X										

*This is a sunk cost, since the outlay for the equipment was made in a previous period.

¹This is an opportunity cost, since it represents the potential benefit that is lost or sacrificed as a result of using the factory space to produce tables. Opportunity cost is a special category of cost that is not ordinarily recorded in an organization's accounting books. To avoid possible confusion with other costs, we will not attempt to classify this cost in any other way except as an opportunity cost.

Review Problem 2: Schedule of Cost of Goods Manufactured and Income Statement

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

Selling expenses	\$ 140,000
Raw materials inventory, January 1	90,000
Raw materials inventory, December 31	60,000
Utilities, factory	36,000
Direct labor cost	150,000
Depreciation, factory	162,000
Purchases of raw materials	750,000
Sales	2,500,000
Insurance, factory	40,000
Supplies, factory	15,000
Administrative expenses	270,000
Indirect labor	300,000
Maintenance, factory	87,000
Work in process inventory, January 1	180,000
Work in process inventory, December 31	100,000
Finished goods inventory, January 1	260,000
Finished goods inventory, December 31	210,000

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

Required:

1. Prepare a schedule of cost of goods manufactured as in Exhibit 2-4.
2. Compute the cost of goods sold.
3. Using data as needed from (1) and (2) above, prepare an income statement.

Solution to Review Problem 2

1.

KLEAR-SEAL COMPANY
Schedule of Cost of Goods Manufactured
For the Year Ended December 31

Direct materials:

Raw materials inventory, January 1	\$ 90,000
Add: Purchases of raw materials	750,000
	<u>840,000</u>
Raw materials available for use	840,000
Deduct: Raw materials inventory, December 31	<u>60,000</u>
	\$ 780,000

Raw materials used in production

150,000

Direct labor:

Manufacturing overhead:	
Utilities, factory	36,000
Depreciation, factory	162,000
Insurance, factory	40,000
Supplies, factory	15,000
Indirect labor	300,000
Maintenance, factory	87,000
	<u>640,000</u>

Total overhead costs

1,570,000

Total manufacturing costs

1,300,000

Add: Work in process inventory, January 1

1,750,000

Deduct: Work in process inventory, December 31

100,000

Cost of goods manufactured

\$1,650,000

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

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

3.

KLEAR-SEAL COMPANY
Income Statement
For the Year Ended December 31

Sales	\$2,500,000
Less cost of goods sold (above)	<u>1,700,000</u>
	800,000
Gross margin	800,000
Less selling and administrative expenses:	
Selling expenses	\$140,000
Administrative expenses	<u>270,000</u>
	410,000
Total selling and administrative expenses	<u>\$ 390,000</u>
Net operating income	

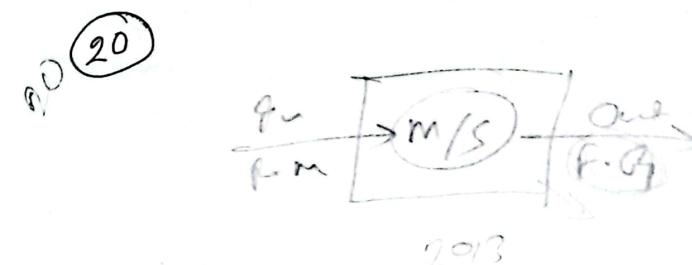
(18)

Glossary

- Administrative costs** All executive, organizational, and clerical costs associated with the general management of an organization rather than with manufacturing, marketing, or selling. (p. 42)
- Common costs** A common cost is incurred to support a number of costing objects but cannot be traced to them individually. For example, the wage cost of the pilot of a 747 airliner is a common cost of all of the passengers on the aircraft. Without the pilot, there would be no flight and no passengers. But no part of the pilot's wage is caused by any one passenger taking the flight. (p. 55)
- Conversion cost** Direct labor cost plus manufacturing overhead cost. (p. 42)
- Cost behavior** The way in which a cost reacts or responds to changes in the level of business activity. (p. 52)
- Cost object** Anything for which cost data are desired. Examples of possible cost objects are products, product lines, customers, jobs, and organizational subunits such as departments or divisions of a company. (p. 55)
- Cost of goods manufactured** The manufacturing costs associated with the goods that were finished during the period. (p. 48)
- Differential cost** A difference in cost between any two alternatives. Also see *Incremental cost*. (p. 55)
- Differential revenue** The difference in revenue between any two alternatives. (p. 55)
- Direct cost** A cost that can be easily and conveniently traced to a specified cost object. (p. 55)
- Direct labor** Those factory labor costs that can be easily traced to individual units of product. Also called *touch labor*. (p. 41)
- Direct materials** Those materials that become an integral part of a finished product and can be conveniently traced into it. (p. 41)
- Fixed cost** A cost that remains constant, in total, regardless of changes in the level of activity within the relevant range. If a fixed cost is expressed on a per unit basis, it varies inversely with the level of activity. (p. 53)
- Incremental cost** An increase in cost between two alternatives. Also see *Differential cost*. (p. 55)
- Indirect cost** A cost that cannot be easily and conveniently traced to a specified cost object. (p. 55)
- Indirect labor** The labor costs of janitors, supervisors, materials handlers, and other factory workers that cannot be conveniently traced directly to particular products. (p. 41)
- Indirect materials** Small items of material such as glue and nails. These items may become an integral part of a finished product but are traceable to the product only at great cost or inconvenience. (p. 41)
- Inventoriable costs** Synonym for *product costs*. (p. 43)
- Manufacturing overhead** All costs associated with manufacturing except direct materials and direct labor. (p. 41)
- Marketing or selling costs** All costs necessary to secure customer orders and get the finished product or service into the hands of the customer. (p. 42)
- Opportunity cost** The potential benefit that is given up when one alternative is selected over another. (p. 57)
- Period costs** Costs that are taken directly to the income statement as expenses in the period in which they are incurred or accrued; such costs consist of selling (marketing) and administrative expenses. (p. 43)
- Prime cost** Direct materials cost plus direct labor cost. (p. 42)
- Product costs** All costs that are involved in the purchase or manufacture of goods. In the case of manufactured goods, these costs consist of direct materials, direct labor, and manufacturing overhead. Also see *Inventoriable costs*. (p. 43)
- Raw materials** Any materials that go into the final product. (p. 40)
- Relevant range** The range of activity within which assumptions about variable and fixed cost behavior are valid. (p. 54)
- Schedule of cost of goods manufactured** A schedule showing the direct materials, direct labor, and manufacturing overhead costs incurred for a period and assigned to Work in Process and completed goods. (p. 48)
- Sunk cost** Any cost that has already been incurred and that cannot be changed by any decision made now or in the future. (p. 57)
- Variable cost** A cost that varies, in total, in direct proportion to changes in the level of activity. A variable cost is constant per unit. (p. 52)

Cost of goods sold statement

1) Raw or Direct materials :		
Beginning inventory / <u>1,811</u>	XXX	
(+) Purchase of materials.....	XXX	
(-) Purchase Returns.....	XXX	
(-) Purchase Discount.....	XXX	
(+) Freight in / <u>1,700</u>	XXX	
Cost of raw materials available for use	<u>XXX</u>	
(-) Ending inventory.....	XXX	
Cost of raw/direct materials used.....	<u>XXX</u>	
2) Direct labor:		XXX
Prime cost (1+2).....	<u>XXX</u>	
3) Factory overhead :		XXX
Factory insurance.....	XXX	
Factory rent.....	XXX	
Depreciation on factory machine/building.....	XXX	
Indirect materials.....	XXX	
Indirect labor.....	XXX	
Payroll tax.....	XXX	
Utility expenses.....	XXX	
Maintenance cost.....	XXX	
General and other factory expense.....	<u>XXX</u>	
Total manufacturing cost.....		XXX
(+) Beginning inventory of work in process (WIP).....	XXX	
(-) Ending inventory of work in process (WIP).....	<u>XXX</u>	
Cost of goods manufactured.....		XXX
(+) Beginning inventory of finished goods.....	<u>XXX</u>	
Cost of goods available for use		XXX
(-) Ending inventory of finished goods.....	XXX	
Cost of goods sold.....		<u>XXX</u>



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EXERCISE 2-5 (Appendix 2B) Classification of Quality Costs [LO9]

Below are listed several activities that are part of a company's quality control system:

- a. Repairs of goods still under warranty.
- b. Customer returns due to defects.
- c. Statistical process control.
- d. Disposal of spoiled goods.
- e. Maintaining testing equipment.
- f. Inspecting finished goods.
- g. Downtime caused by quality problems.
- h. Debugging errors in software.
- i. Recalls of defective products.
- j. Training quality engineers.
- k. Re-entering data due to typing errors.
- l. Inspecting materials received from suppliers.
- m. Audits of the quality system.
- n. Supervision of testing personnel.
- o. Rework labor.

Required:

1. Classify the costs associated with each of these activities into one of the following categories: prevention cost, appraisal cost, internal failure cost, or external failure cost.
2. Which of the four types of costs listed in (1) above are incurred to keep poor quality of conformance from occurring? Which of the four types of costs are incurred because poor quality of conformance has occurred?

EXERCISE 2-6 Product Cost Flows; Product versus Period Costs [LO2, LO3]

Ryser Company was organized on May 1. On that date the company purchased 35,000 plastic emblems, each with a peel-off adhesive backing. The front of the emblems contained the company's name, accompanied by an attractive logo. Each emblem cost Ryser Company \$2.

During May, 31,000 emblems were drawn from the Raw Materials inventory account. Of these, 1,000 were taken by the sales manager to an important sales meeting with prospective customers and handed out as an advertising gimmick. The remaining emblems drawn from inventory were affixed to units of the company's product that were being manufactured during May. Of the units of product having emblems affixed during May, 90% were completed and transferred from Work in Process to Finished Goods. Of the units completed during the month, 75% were sold and shipped to customers.

Required:

1. Determine the cost of emblems that would be in each of the following accounts at May 31:
 - a. Raw Materials.
 - b. Work in Process.
 - c. Finished Goods.
 - d. Cost of Goods Sold.
 - e. Advertising Expense.
2. Specify whether each of the above accounts would appear on the balance sheet or on the income statement at May 31.

EXERCISE 2-7 Preparation of a Schedule of Cost of Goods Manufactured and Cost of Goods Sold [LO1, LO3, LO4]

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

Costs incurred:

Advertising expense	\$100,000
Direct labor cost	90,000
Purchases of raw materials	132,000
Rent, factory building	80,000
Indirect labor	56,300
Sales commissions	35,000
Utilities, factory	9,000
Maintenance, factory equipment	24,000
Supplies, factory	700
Depreciation, office equipment	8,000
Depreciation, factory equipment	40,000

(21)

	Beginning of Year	End of Year
Inventories:		
Raw materials	\$8,000	\$10,000
Work in process	5,000	20,000
Finished goods	70,000	25,000

Required:

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

EXERCISE 2-8 (Appendix 2A) Classification of Overtime Cost [LO8]

Several weeks ago you called Jiffy Plumbing Company to have some routine repair work done on the plumbing system in your home. The plumber came about two weeks later, at four o'clock in the afternoon, and spent two hours completing your repair work. When you received your bill from the company, it contained a \$75 charge for labor—\$30 for the first hour and \$45 for the second.

When questioned about the difference in hourly rates, the company's service manager explained that the higher rate for the second hour contained a charge for an "overtime premium," since the union required that plumbers be paid time and a half for any work in excess of eight hours per day. The service manager further explained that the company was working overtime to "catch up a little" on its backlog of work orders, but still needed to maintain a "decent" profit margin on the plumbers' time.

Required:

1. Do you agree with the company's computation of the labor charge on your job?
2. Assume that the company pays its plumbers \$20 per hour for the first eight hours worked in a day and \$30 per hour for any additional time worked. Prepare computations to show how the cost of the plumber's time for the day (nine hours) should be allocated between direct labor cost and general overhead cost on the company's books.
3. Under what circumstances might the company be justified in charging an overtime premium for repair work on your home?

EXERCISE 2-9 (Appendix 2B) Using Quality Management Terms [LO9]

Listed below are terms relating to quality management.

Appraisal costs	Quality circles
Quality cost report	Prevention costs
Quality	External failure costs
Internal failure costs	Quality of conformance

Choose the term or terms that most appropriately complete the following statements. The terms can be used more than once. (Note that a blank can hold more than one word.)

1. When a product or service does not conform to customer expectations in terms of features or performance, it is viewed as being poor in _____.
2. A product or service will have a low _____ if it does not function the way its designers intended, or if it has many defects as a result of sloppy manufacture.
3. A company incurs _____ and _____ in an effort to keep poor quality of conformance from occurring.
4. A company incurs _____ and _____ because poor quality of conformance has occurred.
5. Of the four groups of costs associated with quality of conformance, _____ are generally the most damaging to a company.
6. Inspection, testing, and other costs incurred to keep defective products from being shipped to customers are known as _____.
7. _____ are incurred in an effort to eliminate poor product design, defective manufacturing practices, and the providing of substandard service.
8. The costs relating to defects, rejected products, and downtime caused by quality problems are known as _____.
9. When a product that is defective in some way is delivered to a customer, then _____ are incurred.
10. Over time a company's total quality costs should decrease if it redistributes its quality costs by placing its greatest emphasis on _____ and _____.

(22)

(23)

Indirect materials, factory.....	18,000
Factory labor (cutting and assembly).....	90,000
Advertising.....	100,000
Insurance, factory.....	6,000
General office supplies (billing).....	4,000
Property taxes, factory.....	20,000
Utilities, factory.....	45,000

Required:

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

Cost Item	Cost Behavior		Selling or Administrative Cost		Product Cost	
	Variable	Fixed	Direct	Indirect		
Materials used.....	\$430,000					
General office salaries.....		\$110,000	\$110,000			

*To units of product.

2. Total the dollar amounts in each of the columns in (1) above. Compute the average product cost per bookcase.
3. Due to a recession, assume that production drops to only 2,000 bookcases per year. Would you expect the average product cost per bookcase to increase, decrease, or remain unchanged? Explain. No computations are necessary.
4. Refer to the original data. The president's next-door neighbor has considered making himself a bookcase and has priced the necessary materials at a building supply store. He has asked the president whether he could purchase a bookcase from the Heritage Company "at cost," and the president has agreed to let him do so.
 - a. Would you expect any disagreement between the two men over the price the neighbor should pay? Explain. What price does the president probably have in mind? The neighbor?
 - b. Since the company is operating at full capacity, what cost term used in the chapter might be justification for the president to charge the full, regular price to the neighbor and still be selling "at cost"? Explain.

PROBLEM 2-19 Schedule of Cost of Goods Manufactured; Income Statement;
Cost Behavior [I.O1, I.O2, I.O3, I.O4, I.O5]
 Various cost and sales data for Medco, Inc., are given below for the just completed year:

	A	B	C
1 Purchases of raw materials	\$ 90,000		
2 Raw materials inventory, beginning	10,000		
3 Raw materials inventory, ending	17,000		
4 Depreciation, factory	42,000		
5 Insurance, factory	5,000		
6 Direct labor	60,000		
7 Maintenance, factory	30,000		
8 Administrative expenses	70,000		
9 Sales	450,000		
10 Utilities, factory	27,000		
11 Supplies, factory	1,000		
12 Selling expenses	80,000		
13 Indirect labor	65,000		
14 Work in process inventory, beginning	7,000		
15 Work in process inventory, ending	30,000		
16 Finished goods inventory, beginning	10,000		
17 Finished goods inventory, ending	40,000		



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(h) Goods costing \$20,000 were shipped to customers at a sales price of \$26,000

Required: Prepare journal entries for the above transactions.

2. Cost of goods manufactured statement. Mason Company manufactures special machines made to customer specifications. The following information was available at the beginning of October:

Materials inventory	\$16,200
Work in process inventory.....	3,600

During October, direct materials costing \$20,000 were purchased, direct labor cost totaled \$16,500, and factory overhead was \$8,580.

October 31 inventories were:

Materials inventory	\$17,000
Work in process inventory.....	8,120

Required: Prepare a cost of goods manufactured statement for October, 19A
(AICPA adapted)

3. Manufacturing costs; cost of goods manufactured; cost of goods sold. The December 31, 19B trial balance of Menges Company showed

Sales.	\$14,000,500	Sales returns and allowances.	\$ 25,200
Purchases (net)	2,400,000	Factory overhead	1,885,600
Transportation in	32,000	Advertising expense	155,000
Direct labor	3,204,000	Delivery expense	65,000
Sales salaries.....	200,000		

Inventories:	December 31, 19B	December 31, 19A
Finished goods.	\$467,400	\$620,000
Work in process	136,800	129,800
Materials	196,000	176,000

Required: Determine the (1) total manufacturing cost, the (2) cost of goods manufactured, and the (3) cost of goods sold.
(CGAA adapted)

4. Cost of goods sold statement; income statement. The accounting department of Michaelson Company provided the following data for May: sales, \$72,000; marketing expenses, \$3,600; administrative expenses, \$720; other expenses, \$360; purchases, \$36,000; factory overhead, \$10,000; direct labor, \$15,000.

Inventories.	Beginning	Ending
Finished goods.	\$7,000	\$10,200
Work in process.....	8,000	15,000
Materials	8,000	8,500

Required: Prepare the (1) cost of goods sold statement, and the (2) income statement
(CGAA adapted)

5. Cost of goods sold statement. The following data are provided by the controller of Metaxen Corporation

Cash	\$240,000
Accounts receivable	348,000

(25)

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Inventories:

	January 1	December 31
Finished goods	\$44,200	\$66,000
Work in process	29,800	38,800
Materials	88,000	64,000
Materials purchased		\$ 366,000
Sales discount		8,000
Factory overhead (excluding depreciation)		468,400
Marketing and administrative expenses (excluding depreciation)		344,200
Depreciation (90% manufacturing, 10% marketing and administrative expenses)		116,000
Sales		1,844,000
Direct labor		523,600
Freight on materials purchased		6,600
Rental income		64,000
Interest on bonds payable		16,000

Required: Prepare a cost of goods sold statement

(CGAA adapted)

6. Fixed and variable costs. In 19A, the Mercaldo Company had sales of \$19,950,000, with \$11,571,000 variable and \$7,623,000 fixed costs. 19B sales are expected to decrease 15% and the cost relationship is expected to remain constant (the fixed costs will not change).

Required: Determine Mercaldo Company's expected operating income or loss for 19B

PROBLEMS

2-1. Journal entries for the cost accounting cycle. Selected transactions of the Young Company for February are as follows:

- (a) Materials requisitioned: \$18,500 for production and \$2,800 for indirect use.
- (b) Work completed and transferred to finished goods amounted to \$51,800.
- (c) Materials purchased and received, \$32,000.
- (d) The payroll, after deducting 7% FICA tax, 18% federal income tax, and 5% state income tax, was \$35,000. The wages due the employees were paid.
- (e) Of the total payroll, 55% was direct labor, 18% indirect factory labor, 17% marketing salaries, and 10% administrative salaries.
- (f) An additional 13.2% is entered for employer's payroll taxes, representing 7% FICA tax, .8% federal unemployment tax, and 5.4% state unemployment tax. Payroll taxes related to factory production are charged to the factory overhead control account.
- (g) Factory overhead of \$22,000 was charged to production
- (h) Other factory overhead consisted of \$9,450 depreciation on the factory building and equipment, \$600 expired insurance, and \$1,250 other unpaid bills.
- (i) Sales on account totaled \$92,120, with a markup of 40% on the cost of goods sold.
- (j) Cash collections from accounts receivable totaled \$76,000

Required: Prepare journal entries for these transactions.

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2-2. Cost of goods manufactured statement. The following data are from the accounts of Millville Company:

Inventories	July 1, 19A	June 30, 19B
Finished goods	\$20,000	\$28,000
Work in process	60,000	36,000
Materials	40,000	48,000
Sales discounts		\$ 8,000
Purchase discounts		3,200
Sales		1,800,000
Purchase returns and allowances		20,000
Depreciation - factory machinery		160,000
Factory insurance		50,000
Freight out		8,000
Other factory expenses		16,000
Bond interest expense		50,000
Sales salaries		100,000
Freight in		12,000
Direct factory labor		800,000
Materials purchases		400,000
Advertising expense		12,000

Required: Prepare a cost of goods manufactured statement for the year ended June 30, 19B. (CGAA adapted)

2-3. Cost of goods sold statement. The following information has been taken from the records of Maxwell Company:

Inventories	January 1	December 31
Finished goods	\$ 5,000	\$ 7,000
Work in process	15,000	9,000
Materials	10,000	12,000
Materials purchases		\$100,000
Direct labor		200,000
Freight in		3,000
Sales salaries and expenses		25,000
Other factory expenses		4,000
Freight out		2,000
Factory insurance		12,500
Depreciation - machinery		40,000
Purchase returns and allowances		5,000
Sales		350,000
Purchase discounts		800
Sales discounts		2,000

Required: Prepare a cost of goods sold statement for the year. (CGAA adapted)

2-4. Manufacturing costs. The payroll records of the Maher Company show payments for labor of \$400,000, of which \$80,000 is indirect labor. Materials requisitions show \$100,000 for materials used, of which \$280,000 represents direct materials. Other manufacturing expenses total \$124,000. Finished goods on hand at the end of the period are stated at cost, \$176,000, of which \$40,000 is direct materials cost. Factory overhead is allocated on the basis of direct labor cost.

Required: Determine the amount of direct labor and the amount of factory overhead in finished Goods.

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Bob Lichioni's
notes on the
contribution
margin
method

6

Chapter Six

Cost-Volume-Profit Relationships

LEARNING OBJECTIVES

After studying Chapter 6, you should be able to:

1. Explain how changes in activity affect contribution margin and net operating income.
2. Prepare and interpret a cost-volume-profit (CVP) graph.
3. Use the contribution margin ratio (CM ratio) to compute changes in contribution margin and net operating income resulting from changes in sales volume.
4. Show the effects on contribution margin of changes in variable costs, fixed costs, selling price, and volume.
5. Compute the break-even point.
6. Determine the level of sales needed to achieve a desired target profit.
7. Compute the margin of safety and explain its significance.
8. Compute the degree of operating leverage at a particular level of sales and explain how the degree of operating leverage can be used to predict changes in net operating income.
9. Compute the break-even point for a multiple product company and explain the effects of shifts in the sales mix on contribution margin and the break-even point.

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The Basics of Cost-Volume-Profit (CVP) Analysis

Bob Luchinni's preparation for the Thursday meeting begins where our study of cost behavior in the preceding chapter left off—with the contribution income statement. The contribution income statement emphasizes the behavior of costs and therefore is extremely helpful to a manager in judging the impact on profits of changes in selling price, cost, or volume. Bob will base his analysis on the following contribution income statement he prepared last month:

Acoustic Concepts, Inc. Contribution Income Statement For the Month of June		
	Total	Per Unit
Sales (400 speakers)	\$100,000	\$250
Less variable expenses	60,000	150
Contribution margin	40,000	<u>\$100</u>
Less fixed expenses	35,000	
Net operating income	<u>\$ 5,000</u>	

Notice that sales, variable expenses, and contribution margin are expressed on a per unit basis as well as in total on this contribution income statement. The per unit figures will be very helpful in the work we will be doing in the following pages. Note that this contribution income statement has been prepared for management's use inside the company and would not ordinarily be made available to those outside the company.

Contribution Margin

As explained in the previous chapter, contribution margin is the amount remaining from sales revenue after variable expenses have been deducted. Thus, it is the amount available to cover fixed expenses and then to provide profits for the period. Notice the sequence here—contribution margin is used *first* to cover the fixed expenses, and then whatever remains goes toward profits. If the contribution margin is not sufficient to cover the fixed expenses, then a loss occurs for the period. To illustrate with an extreme example, assume that by the middle of a particular month Acoustic Concepts has been able to sell only one speaker. If the company does not sell any more speakers during the month, the company's income statement will appear as follows:

	Total	Per Unit
Sales (1 speaker)	\$ 250	\$250
Less variable expenses	150	150
Contribution margin	100	<u>\$100</u>
Less fixed expenses	35,000	
Net operating loss	<u>\$34,900</u>	

For each additional speaker that the company is able to sell during the month, \$100 more in contribution margin will become available to help cover the fixed expenses. If a second speaker is sold, for example, then the total contribution margin will increase by \$100 (to a total of \$200) and the company's loss will decrease by \$100, to \$34,800:

LEARNING OBJECTIVE 1
Explain how changes in activity affect contribution margin and net operating income.

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	Total	Per Unit
Sales (2 speakers)	\$ 500	\$250
Less variable expenses	300	150
Contribution margin	200	<u>\$100</u>
Less fixed expenses	35,000	
Net operating loss	<u>\$34,800)</u>	

If enough speakers can be sold to generate \$35,000 in contribution margin, then all of the fixed costs will be covered and the company will have managed to at least *break even* for the month—that is, to show neither profit nor loss but just cover all of its costs. To reach the break-even point, the company will have to sell 350 speakers in a month, since each speaker sold yields \$100 in contribution margin:

	Total	Per Unit
Sales (350 speakers)	\$87,500	\$250
Less variable expenses	52,500	150
Contribution margin	35,000	<u>\$100</u>
Less fixed expenses	35,000	
Net operating income	<u>\$ 0</u>	

Computation of the break-even point is discussed in detail later in the chapter; for the moment, note that the *break-even point* is the level of sales at which profit is zero.

In Business

Will eToys Make It?



The company eToys, which sells toys over the Internet, lost \$190 million in 1999 on sales of \$151 million. One big cost was advertising. eToys spent about \$37 on advertising for each \$100 of sales. (Other e-tailers were spending even more—in some cases, up to \$460 on advertising for each \$100 in sales!)

eToys does have some advantages relative to bricks-and-mortar stores such as Toys "R" Us. eToys has much lower inventory costs since it need only keep on hand one or two of a slow-moving item, whereas a traditional store has to fully stock its shelves. And bricks-and-mortar retail spaces in malls and elsewhere do cost money—on average, about 7% of sales. However, e-tailers such as eToys have their own set of disadvantages. Customers "pick and pack" their own items at a bricks-and-mortar outlet, but e-tailers have to pay employees to carry out this task. This costs eToys about \$33 for every \$100 in sales. And the technology to sell over the net does not come free. eToys paid about \$29 on its website and related technology for every \$100 in sales. However, many of these costs of selling over the net are fixed. Toby Lenk, the CEO of eToys, estimates that the company will pass its break-even point somewhere between \$750 and \$900 million in sales—representing less than 1% of the market for toys.

Source: Erin Kelly, "The Last e-Store on the Block," *Fortune*, September 18, 2000, pp. 214-220.

Once the break-even point has been reached, net income will increase by the unit contribution margin for each additional unit sold. For example, if 351 speakers are sold in a month, then we can expect the net income for the month will be \$100, since the company will have sold 1 speaker more than the number needed to break even:

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LEARNING OBJECTIVE 3
Use the contribution margin ratio (CM ratio) to compute changes in contribution margin and net operating income resulting from changes in sales volume.

Contribution Margin Ratio (CM Ratio)

In the previous section, we explored how cost-volume-profit relations can be visualized. In this section we will see how the *contribution margin ratio* can be used in cost-volume-profit calculations. As the first step, we have added a column to Acoustic Concepts' contribution income statement in which sales revenues, variable expenses, and contribution margin are expressed as a percentage of sales:

	Total	Per Unit	Percent of Sales
Sales (400 speakers)	\$100,000	\$250	100%
Less variable expenses	60,000	150	60%
Contribution margin	40,000	\$100	40%
Less fixed expenses	35,000		
Net operating income	<u><u>\$ 5,000</u></u>		

The contribution margin as a percentage of total sales is referred to as the **contribution margin ratio (CM ratio)**. This ratio is computed as follows:

$$\checkmark \text{ CM ratio} = \frac{\text{Contribution margin}}{\text{Sales}}$$

For Acoustic Concepts, the computations are:

$$\text{CM ratio} = \frac{\text{Total contribution margin}}{\text{Total sales}} = \frac{\$40,000}{\$100,000} = 40\%$$

In a company such as Acoustic Concepts that has only one product, the CM ratio can also be computed as follows:

$$\text{CM ratio} = \frac{\text{Unit contribution margin}}{\text{Unit selling price}} = \frac{\$100}{\$250} = 40\%$$

The CM ratio is extremely useful since it shows how the contribution margin will be affected by a change in total sales. To illustrate, notice that Acoustic Concepts has a CM ratio of 40%. This means that for each dollar increase in sales, total contribution margin will increase by 40 cents ($\$1 \times \text{CM ratio of } 40\%$). Net operating income will also increase by 40 cents, assuming that fixed costs do not change.

As this illustration suggests, the *impact on net operating income of any given dollar change in total sales can be computed in seconds by simply applying the CM ratio to the dollar change*. For example, if Acoustic Concepts plans a \$30,000 increase in sales during the coming month, the contribution margin should increase by \$12,000 ($\$30,000 \text{ increased sales} \times \text{CM ratio of } 40\%$). As we noted above, net operating income will also increase by \$12,000 if fixed costs do not change. This is verified by the following table:

	Sales Volume			Percent of Sales
	Present	Expected	Increase	
Sales	\$100,000	\$130,000	\$30,000	100%
Less variable expenses	60,000	78,000*	18,000	60%
Contribution margin	40,000	52,000	12,000	40%
Less fixed expenses	35,000	35,000	0	
Net operating income	<u><u>\$ 5,000</u></u>	<u><u>\$ 17,000</u></u>	<u><u>\$ 12,000</u></u>	

* $\$130,000 \text{ expected sales} + \$250 \text{ per unit} = 520 \text{ units. } 520 \text{ units} \times \$150 \text{ per unit} = \$78,000$.

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Change in Regular Sales Price Refer to the original data where Acoustic Concepts is currently selling 400 speakers per month. The company has an opportunity to make a bulk sale of 150 speakers to a wholesaler if an acceptable price can be worked out. This sale would not disturb the company's regular sales and would not affect the company's total fixed expenses. What price per speaker should be quoted to the wholesaler if Acoustic Concepts wants to increase its monthly profits by \$3,000?

Solution

Variable cost per speaker	\$150
Desired profit per speaker:	
\$3,000 + 150 speakers.....	<u>20</u>
Quoted price per speaker	<u><u>\$170</u></u>

Notice that fixed expenses are not included in the computation. This is because fixed expenses are not affected by the bulk sale, so all of the additional revenue that is in excess of variable costs increases the profits of the company.

Importance of the Contribution Margin

As stated in the introduction to this chapter, CVP analysis can be used to help find the most profitable combination of variable costs, fixed costs, selling price, and sales volume. The above examples show that the effect of a decision on the contribution margin is often critical. We have seen that profits can sometimes be improved by reducing the contribution margin if fixed costs can be reduced by a greater amount. More commonly, however, we have seen that the way to improve profits is to increase the total contribution margin figure. Sometimes this can be done by reducing the selling price and thereby increasing volume; sometimes it can be done by increasing the fixed costs (such as advertising) and thereby increasing volume; and sometimes it can be done by trading off variable and fixed costs with appropriate changes in volume. Many other combinations of factors are possible.

The size of the unit contribution margin (and the size of the CM ratio) is very important. For example, the greater the unit contribution margin, the greater is the amount that a company will be willing to spend to increase unit sales. This explains in part why companies with high unit contribution margins (such as auto manufacturers) advertise so heavily, while companies with low unit contribution margins (such as dishware manufacturers) tend to spend much less for advertising.

In short, the effect on the contribution margin holds the key to many decisions.

Break-Even Analysis



Concept 6-2

CVP analysis is sometimes referred to simply as break-even analysis. This is unfortunate because break-even analysis is only one element of CVP analysis—although an important element. Break-even analysis is designed to answer questions such as those asked by Prem Narayan, the president of Acoustic Concepts, concerning how far sales could drop before the company begins to lose money.

Break-Even Computations

Earlier in the chapter we defined the break-even point to be the level of sales at which the company's profit is zero. The break-even point can be computed using either the *equation method* or the *contribution margin method*—the two methods are equivalent.

The Equation Method The equation method centers on the contribution approach to the income statement illustrated earlier in the chapter. The format of this income statement can be expressed in equation form as follows:

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$$\text{Profits} = (\text{Sales} - \text{Variable expenses}) - \text{Fixed expenses}$$

Rearranging this equation slightly yields the following equation, which is widely used in CVP analysis:

$$\checkmark \text{Sales} = \text{Variable expenses} + \text{Fixed expenses} + \text{Profits}$$

At the break-even point, profits are zero. Therefore, the break-even point can be computed by finding that point where sales just equal the total of the variable expenses plus the fixed expenses. For Acoustic Concepts, the break-even point in unit sales, Q , can be computed as follows:

$$\text{Sales} = \text{Variable expenses} + \text{Fixed expenses} + \text{Profits}$$

$$\$250Q = \$150Q + \$35,000 + \$0$$

$$\$100Q = \$35,000$$

$$Q = \$35,000 \div \$100 \text{ per speaker}$$

$$Q = 350 \text{ speakers}$$

where:

$$Q = \text{Number (quantity) of speakers sold}$$

$$\$250 = \text{Unit sales price}$$

$$\$150 = \text{Unit variable expenses}$$

$$\$35,000 = \text{Total fixed expenses}$$

The break-even point in sales dollars can be computed by multiplying the break-even level of unit sales by the selling price per unit:

$$350 \text{ speakers} \times \$250 \text{ per speaker} = \$87,500$$

- The break-even in total sales dollars, X , can also be directly computed as follows:

$$\text{Sales} = \text{Variable expenses} + \text{Fixed expenses} + \text{Profits}$$

$$X = 0.60X + \$35,000 + \$0$$

$$0.40X = \$35,000$$

$$X = \$35,000 \div 0.40$$

$$X = \$87,500$$

where:

$$X = \text{Total sales dollars}$$

$$0.60 = \text{Variable expenses as a percentage of sales}$$

$$\$35,000 = \text{Total fixed expenses}$$

Firms often have data available only in percentage form, and the approach we have just illustrated must then be used to find the break-even point. Notice that use of percentages in the equation yields a break-even point in sales dollars rather than in units sold. The break-even point in units sold is the following:

$$\$87,500 \div \$250 \text{ per speaker} = 350 \text{ speakers}$$

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Buying on the Go—A Dot.com Tale

Star CD is a company set up by two young engineers, George Searle and Humphrey Chen, to allow customers to order music CDs on their cell phones. Suppose you hear a cut from a CD on your car radio that you would like to own. Pick up your cell phone, punch "CD," enter the radio station's frequency, and the time you heard the song, and the CD will soon be on its way to you.

Star CD charges about \$17 for a CD, including shipping. The company pays its supplier about \$13, leaving a contribution margin of \$4 per CD. Because of the fixed costs of running the service, Searle expects the company to lose \$1.5 million on sales of \$1.5 million in its first year of operations. That assumes the company sells in excess of 88,000 CDs.

What is the company's break-even point? Working backwards, the company's fixed expenses would appear to be about \$1,850,000 per year. Since the contribution margin per CD is \$4, the company would have to sell over 460,000 CDs per year just to break even!

Source: Peter Kafka, "Play It Again," *Forbes*, July 26, 1999, p. 94.

The Contribution Margin Method The contribution margin method is actually just a shortcut version of the equation method already described. The approach centers on the idea discussed earlier that each unit sold provides a certain amount of contribution margin that goes toward covering fixed costs. To find how many units must be sold to break even, divide the total fixed costs by the unit contribution margin:

$$\checkmark \text{Break-even point in units sold} = \frac{\text{Fixed expenses}}{\text{Unit contribution margin}}$$

Each speaker generates a contribution margin of \$100 (\$250 selling price, less \$150 variable expenses). Since the total fixed expenses are \$35,000, the break-even point is computed as follows:

$$\frac{\text{Fixed expenses}}{\text{Unit contribution margin}} = \frac{\$35,000}{\$100 \text{ per speaker}} = 350 \text{ speakers}$$

A variation of this method uses the CM ratio instead of the unit contribution margin. The result is the break-even in total sales dollars rather than in total units sold.

$$\text{Break-even point in total sales dollars} = \frac{\text{Fixed expenses}}{\text{CM ratio}}$$

In the Acoustic Concepts example, the calculations are as follows:

$$\frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\$35,000}{0.40} = \$87,500$$

This approach, based on the CM ratio, is particularly useful in those situations where a company has multiple product lines and wishes to compute a single break-even point for the company as a whole. More is said on this point in a later section titled The Concept of Sales Mix.

Target Profit Analysis

CVP formulas can be used to determine the sales volume needed to achieve a target profit. Suppose that Prem Narayan of Acoustic Concepts would like to earn a target profit of \$40,000 per month. How many speakers would have to be sold?

The CVP Equation One approach is to use the equation method. Instead of solving for the unit sales where profits are zero, you instead solve for the unit sales where profits are \$40,000.

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$$\begin{aligned}
 \text{Sales} &= \text{Variable expenses} + \text{Fixed expenses} + \text{Profits} \\
 \$250Q &= \$150Q + \$35,000 + \$40,000 \\
 \$100Q &= \$75,000 \\
 Q &= \$75,000 \div \$100 \text{ per speaker} \\
 Q &= 750 \text{ speakers}
 \end{aligned}$$

where:

$$\begin{aligned}
 Q &= \text{Number of speakers sold} \\
 \$250 &= \text{Unit sales price} \\
 \$150 &= \text{Unit variable expenses} \\
 \$35,000 &= \text{Total fixed expenses} \\
 \$40,000 &= \text{Target profit}
 \end{aligned}$$

Thus, the target profit can be achieved by selling 750 speakers per month, which represents \$187,500 in total sales (\$250 per speaker \times 750 speakers).

Thrift Shop Publishing

In Business

Hesh Kestin failed in his attempt at publishing an English-language newspaper in Israel in the 1980s. His conclusion: "Never start a business with too many people or too much furniture." Kestin's newest venture is *The American*, a Sunday-only newspaper for overseas Americans. His idea is to publish *The American* on the one day of the week that the well-established *International Herald Tribune* (circulation, 190,000 copies) does not publish. But following what he learned from his first failed venture, he is doing it on a shoestring.

In contrast to the Paris-based *International Herald Tribune* with its eight-story office tower and staff of 250, Kestin has set up business in a small clapboard building on Long Island. Working at desks purchased from a thrift shop, Kestin's staff of 12 assembles the tabloid from stories pulled off wire services. The result of this frugality is that *The American*'s break-even point is only 14,000 copies. Sales topped 20,000 copies just two months after the paper's first issue.

Source: Jerry Useem, "American Hopes to Conquer the World—from Long Island," *Inc.*, December 1996, p. 23.



The Contribution Margin Approach A second approach involves expanding the contribution margin formula to include the target profit:

$$\begin{aligned}
 \text{Unit sales to attain the target profit} &= \frac{\text{Fixed expenses} + \text{Target profit}}{\text{Unit contribution margin}} \\
 &= \frac{\$35,000 + \$40,000}{\$100 \text{ per speaker}} \\
 &= 750 \text{ speakers}
 \end{aligned}$$

This approach gives the same answer as the equation method since it is simply a shortcut version of the equation method. Similarly, the dollar sales needed to attain the target profit can be computed as follows:

$$\begin{aligned}
 \text{Dollar sales to attain target profit} &= \frac{\text{Fixed expenses} + \text{Target profit}}{\text{CM ratio}} \\
 &= \frac{\$35,000 + \$40,000}{0.40} \\
 &= \$187,500
 \end{aligned}$$

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LEARNING OBJECTIVE 7
Compute the margin of safety and explain its significance.

The Margin of Safety

The margin of safety is the excess of budgeted (or actual) sales over the break-even volume of sales. It states the amount by which sales can drop before losses begin to be incurred. The higher the margin of safety, the lower the risk of not breaking even. The formula for its calculation is:

$$\checkmark \text{Margin of safety} = \text{Total budgeted (or actual) sales} - \text{Break-even sales}$$

The margin of safety can also be expressed in percentage form. This percentage is obtained by dividing the margin of safety in dollar terms by total sales:

$$\text{Margin of safety percentage} = \frac{\text{Margin of safety in dollars}}{\text{Total budgeted (or actual) sales}}$$

The calculations for the margin of safety for Acoustic Concepts are as follows:

Sales (at the current volume of 400 speakers) (a)	\$100,000
Break-even sales (at 350 speakers)	87,500
Margin of safety (in dollars) (b)	<u><u>\$ 12,500</u></u>
Margin of safety as a percentage of sales, (b) ÷ (a)	12.5%

This margin of safety means that at the current level of sales and with the company's current prices and cost structure, a reduction in sales of \$12,500, or 12.5%, would result in just breaking even.

In a single-product firm like Acoustic Concepts, the margin of safety can also be expressed in terms of the number of units sold by dividing the margin of safety in dollars by the selling price per unit. In this case, the margin of safety is 50 speakers (\$12,500 ÷ \$250 per speaker = 50 speakers).

In Business

Soup Nutsy



Pak Melwani and Kumar Hathiramani, former silk merchants from Bombay, opened a soup store in Manhattan after watching a *Seinfeld* episode featuring the "soup Nazi." The episode parodied a real-life soup vendor, Ali Yeganeh, whose loyal customers put up with hour-long lines and "snarling customer service." Melwani and Hathiramani approached Yeganeh about turning his soup kitchen into a chain, but they were gruffly rebuffed. Instead of giving up, the two hired a French chef with a repertoire of 500 soups and opened a store called Soup Nutsy. For \$6 per serving, Soup Nutsy offers 12 homemade soups each day, such as sherry crab bisque and Thai coconut shrimp. Melwani and Hathiramani report that in their first year of operation, they netted \$210,000 on sales of \$700,000. They report that it costs about \$2 per serving to make the soup. So their variable expense ratio is one-third (\$2 cost + \$6 selling price). If so, what are their fixed expenses? We can answer that question using the equation approach as follows:

$$\text{Sales} = \text{Variable expenses} + \text{Fixed expenses} + \text{Profits}$$

$$\$700,000 = \left(\frac{1}{3} \times \$700,000\right) + \text{Fixed expenses} + \$210,000$$

$$\begin{aligned}\text{Fixed expenses} &= \$700,000 - \left(\frac{1}{3} \times \$700,000\right) - \$210,000 \\ &= \$256,667\end{aligned}$$

With this information, you can determine that Soup Nutsy's break-even point is about \$385,000 of sales. This gives the store a comfortable margin of safety of 45% of sales.

Source: Silva Sanson, "The Starbucks of Soup?" *Forbes*, July 7, 1997, pp. 90-91.

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Total current sales (a)	\$100,000	\$100,000
Break-even sales	75,000	85,714
Margin of safety in sales dollars (b)	<u>\$ 25,000</u>	<u>\$ 14,286</u>
Margin of safety as a percentage of sales, (b) + (a)	25.0%	14.3%

This analysis makes it clear that Bogside Farm is less vulnerable to downturns than Sterling Farm. We can identify two reasons why it is less vulnerable. First, due to its lower fixed expenses, Bogside Farm has a lower break-even point and a higher margin of safety, as shown by the computations above. Therefore, it will not incur losses as quickly as Sterling Farm in periods of sharply declining sales. Second, due to its lower CM ratio, Bogside Farm will not lose contribution margin as rapidly as Sterling Farm when sales fall off. Thus, Bogside Farm's income will be less volatile. We saw earlier that this is a drawback when sales increase, but it provides more protection when sales drop.

To summarize, without knowing the future, it is not obvious which cost structure is better. Both have advantages and disadvantages. Sterling Farm, with its higher fixed costs and lower variable costs, will experience wider swings in net income as changes take place in sales, with greater profits in good years and greater losses in bad years. Bogside Farm, with its lower fixed costs and higher variable costs, will enjoy greater stability in net operating income and will be more protected from losses during bad years, but at the cost of lower net operating income in good years.

Operating Leverage

A lever is a tool for multiplying force. Using a lever, a massive object can be moved with only a modest amount of force. In business, *operating leverage* serves a similar purpose. **Operating leverage** is a measure of how sensitive net operating income is to percentage changes in sales. Operating leverage acts as a multiplier. If operating leverage is high, a small percentage increase in sales can produce a much larger percentage increase in net operating income.

Operating leverage can be illustrated by returning to the data given above for the two blueberry farms. We previously showed that a 10% increase in sales (from \$100,000 to \$110,000 in each farm) results in a 70% increase in the net operating income of Sterling Farm (from \$10,000 to \$17,000) and only a 40% increase in the net operating income of Bogside Farm (from \$10,000 to \$14,000). Thus, for a 10% increase in sales, Sterling Farm experiences a much greater percentage increase in profits than does Bogside Farm. Therefore, Sterling Farm has greater operating leverage than Bogside Farm.

The degree of operating leverage at a given level of sales is computed by the following formula:

$$\checkmark \text{Degree of operating leverage} = \frac{\text{Contribution margin}}{\text{Net operating income}}$$

The degree of operating leverage is a measure, at a given level of sales, of how a percentage change in sales volume will affect profits. To illustrate, the degree of operating leverage for the two farms at a \$100,000 sales level would be computed as follows:

$$\text{Bogside Farm: } \frac{\$40,000}{\$10,000} = 4$$

$$\text{Sterling Farm: } \frac{\$70,000}{\$10,000} = 7$$

Since the degree of operating leverage for Bogside Farm is 4, the farm's net operating income grows four times as fast as its sales. Similarly, Sterling Farm's net operating income grows seven times as fast as its sales. Thus, if sales increase by 10%, then we can expect the net operating income of Bogside Farm to increase by four times this amount, or by

LEARNING OBJECTIVE 8
Compute the degree of operating leverage at a particular level of sales and explain how the degree of operating leverage can be used to predict changes in net operating income.

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2. Costs are linear and can be accurately divided into variable and fixed elements. The variable element is constant per unit, and the fixed element is constant in total over the entire relevant range.
3. In multiproduct companies, the sales mix is constant.
4. In manufacturing companies, inventories do not change. The number of units produced equals the number of units sold.

While some of these assumptions may be violated in practice, the violations are usually not serious enough to call into question the basic validity of CVP analysis. For example, in most multiproduct companies, the sales mix is constant enough so that the results of CVP analysis are reasonably valid.

Perhaps the greatest danger lies in relying on simple CVP analysis when a manager is contemplating a large change in volume that lies outside of the relevant range. For example, a manager might contemplate increasing the level of sales far beyond what the company has ever experienced before. However, even in these situations a manager can adjust the model as we have done in this chapter to take into account anticipated changes in selling prices, fixed costs, and the sales mix that would otherwise violate the assumptions. For example, in a decision that would affect fixed costs, the change in fixed costs can be explicitly taken into account as illustrated earlier in the chapter in the Acoustic Concepts example on page 241.

Summary

CVP analysis involves finding the most favorable combination of variable costs, fixed costs, selling price, sales volume, and mix of products sold. Trade-offs are possible between types of costs, as well as between costs and selling price, and between selling price and sales volume. Sometimes these trade-offs are desirable, and sometimes they are not. CVP analysis provides the manager with a powerful tool for identifying those courses of action that will improve profitability.

The concepts developed in this chapter represent a way of thinking rather than a mechanical set of procedures. That is, to put together the optimum combination of costs, selling price, and sales volume, the manager must be trained to think in terms of the unit contribution margin, the break-even point, the CM ratio, the sales mix, and the other concepts developed in this chapter.

Review Problem: CVP Relationships

Volar Company manufactures and sells a telephone answering machine. The company's contribution format income statement for the most recent year is given below:

	Total	Per Unit	Percent of Sales
Sales (20,000 units).....	\$1,200,000	\$60	100%
Less variable expenses.....	<u>900,000</u>	<u>45</u>	<u>7%</u>
Contribution margin.....	300,000	<u>\$15</u>	<u>?</u> %
Less fixed expenses.....	<u>240,000</u>		
Net operating income.....	<u><u>\$ 60,000</u></u>		

Management is anxious to improve the company's profit performance and has asked for an analysis of a number of items.

Required:

1. Compute the company's CM ratio and variable expense ratio.
2. Compute the company's break-even point in both units and sales dollars. Use the equation method.
3. Assume that sales increase by \$400,000 next year. If cost behavior patterns remain unchanged, by how much will the company's net operating income increase? Use the CM ratio to determine your answer.

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4. Refer to the original data. Assume that next year management wants the company to earn a minimum profit of \$90,000. How many units will have to be sold to meet this target profit figure?
5. Refer to the original data. Compute the company's margin of safety in both dollar and percentage form.
6.
 - a. Compute the company's degree of operating leverage at the present level of sales.
 - b. Assume that through a more intense effort by the sales staff the company's sales increase by 8% next year. By what percentage would you expect net operating income to increase? Use the operating leverage concept to obtain your answer.
 - c. Verify your answer to (b) by preparing a new income statement showing an 8% increase in sales.
7. In an effort to increase sales and profits, management is considering the use of a higher-quality speaker. The higher-quality speaker would increase variable costs by \$3 per unit, but management could eliminate one quality inspector who is paid a salary of \$30,000 per year. The sales manager estimates that the higher-quality speaker would increase annual sales by at least 20%.
 - a. Assuming that changes are made as described above, prepare a projected income statement for next year. Show data on a total, per unit, and percentage basis.
 - b. Compute the company's new break-even point in both units and dollars of sales. Use the contribution margin method.
 - c. Would you recommend that the changes be made?

Solution to Review Problem

1. $CM\ ratio = \frac{\text{Contribution margin}}{\text{Selling price}} = \frac{\$15}{\$60} = 25\%$

$\text{Variable expense ratio} = \frac{\text{Variable expense}}{\text{Selling price}} = \frac{\$45}{\$60} = 75\%$

2. $\text{Sales} = \text{Variable expenses} + \text{Fixed expenses} + \text{Profits}$

$\$60Q = \$45Q + \$240,000 + \0

$\$15Q = \$240,000$

$Q = \$240,000 + \15 per unit

$Q = 16,000 \text{ units; or at } \$60 \text{ per unit, } \$960,000$

+ Alternative solution:

$X = 0.75X + \$240,000 + \0

$0.25X = \$240,000$

$X = \$240,000 + 0.25$

$X = \$960,000; \text{ or at } \$60 \text{ per unit, } 16,000 \text{ units}$

3.	Increase in sales.....	\$400,000
	Multiply by the CM ratio.....	$\times 25\%$
	Expected increase in contribution margin.....	<u>\$100,000</u>

Since the fixed expenses are not expected to change, net operating income will increase by the entire \$100,000 increase in contribution margin computed above.

4. Equation method:

$\text{Sales} = \text{Variable expenses} + \text{Fixed expenses} + \text{Profits}$

$\$60Q = \$45Q + \$240,000 + \$90,000$

$\$15Q = \$330,000$

$Q = \$330,000 + \15 per unit

$Q = 22,000 \text{ units}$

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Contribution margin method:

$$\frac{\text{Fixed expenses} + \text{Target profit}}{\text{Contribution margin per unit}} = \frac{\$240,000 + \$90,000}{\$15 \text{ per unit}} = 22,000 \text{ units}$$

Break-even sales

- $$\text{Margin of safety in dollars} = \frac{\text{Margin of safety in dollars}}{\text{Total sales}} = \frac{\$240,000}{\$1,200,000} = 20\%$$

$$\text{Margin of safety percentage} = \frac{\text{Margin of safety in dollars}}{\text{Total sales}} = \frac{\$240,000}{\$1,200,000} = 20\%$$

- | | | | |
|-------|---|----------------------|-----|
| 6. a. | Degree of operating leverage = | Net operating income | 8% |
| b. | Expected increase in sales | | × 5 |
| | Degree of operating leverage | | 40% |
| | Expected increase in net operating income | | = |

c. If sales increase by 8%, then 21,600 units ($20,000 \times 1.08 = 21,600$) will be sold next year. The new income statement will be as follows:

If sales increase by 8%, then 21,600 units per year. The new income statement will be as follows:		Percent of Sales
	Total	Per Unit
Sales (21,600 units)	\$1,296,000	\$60
Less variable expenses	<u>972,000</u>	<u>45</u>
Contribution margin	324,000	<u>\$15</u>
Less fixed expenses	<u>240,000</u>	<u><u> </u></u>
Net operating income	<u><u>\$ 84,000</u></u>	<u><u> </u></u>

Thus, the \$84,000 expected net operating income for next year represents a 40% increase over the \$60,000 net operating income earned during the current year:

$$\frac{\$84,000 - \$60,000}{\$60,000} = \frac{\$24,000}{\$60,000} = 40\% \text{ increase}$$

Note from the income statement above that the increase in sales from 20,000 to 21,600 units, has resulted in increases in *both* total sales and total variable expenses. It is a common error to overlook the increase in variable expenses when preparing a projected income statement.

7. a. A 20% increase in sales would result in 24,000 units being sold next year: $20,000 \text{ units} \times 1.20 = 24,000 \text{ units}$

	Total	Per Unit	Percent of Sales
Sales (24,000 units)	\$1,440,000	\$60	100%
Less variable expenses.	1,152,000	48*	80%
Contribution margin.	288,000	\$12	20%
Less fixed expenses	210,000†	==	==
Net operating income	\$ 78,000		

$$*\$45 + \$3 = \$48; \$48 \div \$60 = 80\%.$$

$$^1\$240,000 - \$30,000 = \$210,000.$$

Note that the change in per unit variable expenses results in a change in both the per unit contribution margin and the CM ratio.

$$b. \text{ Break-even point in unit sales} = \frac{\text{Fixed expenses}}{\text{Contribution margin per unit}}$$

$$= \frac{\$210,000}{\$12 \text{ per unit}} = 17,500 \text{ units}$$

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CS CamScanner

$$\text{Break-even point in dollar sales} = \frac{\text{Fixed expenses}}{\text{CM ratio}}$$

$$= \frac{\$210,000}{0.20} = \$1,050,000$$

c. Yes, based on these data the changes should be made. The changes will increase the company's net operating income from the present \$60,000 to \$78,000 per year. Although the changes will also result in a higher break-even point (17,500 units as compared to the present 16,000 units), the company's margin of safety will actually be wider than before:

$$\text{Margin of safety in dollars} = \text{Total sales} - \text{Break-even sales}$$

$$= \$1,440,000 - \$1,050,000 = \$390,000$$

As shown in (5) above, the company's present margin of safety is only \$240,000. Thus, several benefits will result from the proposed changes.

Glossary

- Break-even point** The level of sales at which profit is zero. The break-even point can also be defined as the point where total sales equals total expenses or as the point where total contribution margin equals total fixed expenses. (p. 236)
- Contribution margin method** A method of computing the break-even point in which the fixed expenses are divided by the contribution margin per unit. (p. 246)
- Contribution margin ratio (CM ratio)** The contribution margin as a percentage of total sales. (p. 240)
- Cost-volume-profit (CVP) graph** The relations between revenues, costs, and level of activity in an organization presented in graphic form. (p. 237)
- Degree of operating leverage** A measure, at a given level of sales, of how a percentage change in sales volume will affect profits. The degree of operating leverage is computed by dividing contribution margin by net operating income. (p. 251)
- Equation method** A method of computing the break-even point that relies on the equation Sales = Variable expenses + Fixed expenses + Profits. (p. 244)
- Incremental analysis** An analytical approach that focuses only on those items of revenue, cost, and volume that will change as a result of a decision. (p. 242)
- Margin of safety** The excess of budgeted (or actual) sales over the break-even volume of sales. (p. 248)
- Operating leverage** A measure of how sensitive net operating income is to a given percentage change in sales. It is computed by dividing the contribution margin by net operating income. (p. 251)
- Sales mix** The relative proportions in which a company's products are sold. Sales mix is computed by expressing the sales of each product as a percentage of total sales. (p. 253)

Questions

- 6-1 What is meant by a product's CM ratio? How is this ratio useful in planning business operations?
- 6-2 Often the most direct route to a business decision is an incremental analysis. What is meant by an *incremental analysis*?
- 6-3 Company A's cost structure includes costs that are mostly variable, whereas Company B's cost structure includes costs that are mostly fixed. In a time of increasing sales, which company will tend to realize the most rapid increase in profits? Explain.
- 6-4 What is meant by the term *operating leverage*?
- 6-5 A 10% decrease in the selling price of a product will have the same impact on net income as a 10% increase in the variable expenses. Do you agree? Why or why not?
- 6-6 What is meant by the term *break-even point*?
- 6-7 Name three approaches to break-even analysis. Briefly explain how each approach works.
- 6-8 In response to a request from your immediate supervisor, you have prepared a CVP graph portraying the cost and revenue characteristics of your company's product and operations.

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Explain how the lines on the graph and the break-even point would change if (a) the selling price per unit decreased, (b) fixed costs increased throughout the entire range of activity portrayed on the graph, and (c) variable costs per unit increased.

6-9 Al's Auto Wash charges \$4 to wash a car. The variable costs of washing a car are 15% of sales. Fixed expenses total \$1,700 monthly. How many cars must be washed each month for Al to break even?

6-10 What is meant by the margin of safety?

6-11 Companies X and Y are in the same industry. Company X is highly automated, whereas Company Y relies primarily on labor to make its products. If sales and total expenses in the two companies are about the same, which would you expect to have the lower margin of safety? Why?

6-12 What is meant by the term *sales mix*? What assumption is usually made concerning sales mix in CVP analysis?

6-13 Explain how a shift in the sales mix could result in both a higher break-even point and a lower net income.

Exercises

EXERCISE 6-1 Using a Contribution Format Income Statement [LO1, LO4]
Porter Company's most recent income statement is shown below.

For the Company's most recent income statement is shown below.

	Total	Per Unit
Sales (30,000 units)	\$150,000	\$5
Less variable expenses	80,000	3
Contribution margin	60,000	\$2
Less fixed expenses	50,000	
Net operating income	\$ 10,000	

Required:

Prepare a new income statement under each of the following conditions (consider one at a time):

1. The sales volume increases by 15%.
 2. The selling price decreases by 50 cents per unit, and the sales volume increases by 20%.
 3. The selling price increases by 50 cents per unit, fixed expenses increase by \$10,000, and the sales volume decreases by 5%.
 4. Variable expenses increase by 20 cents per unit, the selling price increases by 12%, and the sales volume decreases by 10%.

EXERCISE 6–2 Break-Even Analysis and CVP Graphing [LO2, LO4, LO5]

Chi Omega Sorority is planning its annual Riverboat Extravaganza. The Extravaganza committee has assembled the following expected costs for the event:

Dinner (per person)	\$ 7
Favors and program (per person)	3
Band	
Tickets and advertising	1,500
Riverboat rental	700
Floorshow and strolling entertainers	4,800
	1,000

Required:

The committee members would like to charge \$10.

1. Compute the break-even point for the Extravaganza (in terms of the number of persons that must attend).
 2. Assume that only 250 persons attended the Extravaganza last year. If the same number attend this year, what price per ticket must be charged to break even?
 3. Refer to the original data (\$30 ticket price per person). Prepare a CVP graph for the Extravaganza from a zero level of activity up to 600 tickets sold. Number of persons should be placed on the horizontal (X) axis, and dollars should be placed on the vertical (Y) axis.

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EXERCISE 6-3 Break-Even and Target Profit Analysis [LO4, LO5, LO6]

Revgen Products sells camping equipment. One of the company's products, a camp lantern, sells for \$90 per unit. Variable expenses are \$63 per lantern, and fixed expenses associated with the lantern total \$135,000 per month.

Required:

1. Compute the company's break-even point in number of lanterns and in total sales dollars.
2. If the variable expenses per lantern increase as a percentage of the selling price, will it result in a higher or a lower break-even point? Why? (Assume that the fixed expenses remain unchanged.)
3. At present, the company is selling 8,000 lanterns per month. The sales manager is convinced that a 10% reduction in the selling price will result in a 25% increase in the number of lanterns sold each month. Prepare two contribution income statements, one under present operating conditions, and one as operations would appear after the proposed changes. Show both total and per unit data on your statements.
4. Refer to the data in (3) above. How many lanterns would have to be sold at the new selling price to yield a minimum net operating income of \$72,000 per month?

EXERCISE 6-4 Operating Leverage [LO4, LO8]

Superior Door Company sells prehung doors to home builders. The doors are sold for \$60 each. Variable costs are \$42 per door, and fixed costs total \$450,000 per year. The company is currently selling 30,000 doors per year.

Required:

1. Prepare a contribution format income statement for the company at the present level of sales and compute the degree of operating leverage.
2. Management is confident that the company can sell 37,500 doors next year (an increase of 7,500 doors, or 25% over current sales). Compute the following:
 - a. The expected percentage increase in net operating income for next year.
 - b. The expected total dollar net operating income for next year. (Do not prepare an income statement; use the degree of operating leverage to compute your answer.)

EXERCISE 6-5 Multiproduct Break-Even Analysis [LO9]

Okabee Enterprises sells two products, Model A100 and Model B900. Monthly sales and the contribution margin ratios for the two products follow:

	Product		
	Model A100	Model B900	Total
Sales	\$700,000	\$300,000	\$1,000,000
Contribution margin ratio.....	60%	70%	?

The company's fixed expenses total \$598,500 per month.

Required:

1. Prepare an income statement for the company as a whole. Use the format shown in Exhibit 6-3.
2. Compute the break-even point for the company based on the current sales mix.
3. If sales increase by \$50,000 per month, by how much would you expect net operating income to increase? What are your assumptions?

EXERCISE 6-6 Break-Even Analysis; Target Profit; Margin of Safety;

CM Ratio [LO1, LO3, LO5, LO6, LO7]

Pringle Company sells a single product. The company's sales and expenses for a recent month follow:

	Total	Per Unit
Sales	\$600,000	\$40
Less variable expenses	420,000	28
Contribution margin	180,000	\$12
Less fixed expenses	150,000	
Net operating income	<u><u>\$ 30,000</u></u>	

Required:

1. What is the monthly break-even point in units sold and in sales dollars?

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- Without resorting to computations, what is the total contribution margin at the break-even point?
- How many units would have to be sold each month to earn a minimum target profit of \$18,000? Use the contribution margin method. Verify your answer by preparing a contribution income statement at the target level of sales.
- Refer to the original data. Compute the company's margin of safety in both dollar and percentage terms.
- What is the company's CM ratio? If monthly sales increase by \$80,000 and there is no change in fixed expenses, by how much would you expect monthly net operating income to increase?

EXERCISE 6-7 Break-Even and Target Profit Analysis [LO3, LO4, LO5, LO6]
 Super Sales Company is the exclusive distributor for a revolutionary bookbag. The product sells for \$60 per unit and has a CM ratio of 40%. The company's fixed expenses are \$360,000 per year.

Required:

- What are the variable expenses per unit?
- Using the equation method:
 - What is the break-even point in units and in sales dollars?
 - What sales level in units and in sales dollars is required to earn an annual profit of \$90,000?
 - Assume that through negotiation with the manufacturer the Super Sales Company is able to reduce its variable expenses by \$3 per unit. What is the company's new break-even point in units and in sales dollars?
- Repeat (2) above using the contribution margin method.

EXERCISE 6-8 Missing Data; Basic CVP Concepts [LO1, LO9]

Fill in the missing amounts in each of the eight case situations below. Each case is independent of the others. (Hint: One way to find the missing amounts would be to prepare a contribution income statement for each case, enter the known data, and then compute the missing items.)

- Assume that only one product is being sold in each of the four following case situations:

Case	Units Sold	Sales	Contribution Margin			Fixed Expenses	Net Operating Income (Loss)
			Variable Expenses	Margin per Unit	Average Contribution Margin		
1	8,000	\$270,000	\$162,000	\$?	\$?	\$ 90,000	\$?
2	?	350,000	?	15	?	170,000	40,000
3	20,000	?	280,000	6	?	?	35,000
4	5,000	160,000	?	?	?	82,000	(12,000)

- Assume that more than one product is being sold in each of the four following case situations:

Case	Sales	Variable Expenses	Average Contribution Margin			Fixed Expenses	Net Operating Income (Loss)
			(Percent)	Margin	Average Contribution Margin		
1	\$450,000	\$?	40	\$?	\$?	\$65,000	\$?
2	200,000	130,000	?	?	?	60,000	?
3	?	?	80	?	?	470,000	90,000
4	300,000	90,000	?	?	?	?	(15,000)

Problems

PROBLEM 6-9 Basics of CVP Analysis; Cost Structure [LO1, LO3, LO4, LO5, LO6]

Memofox, Inc., produces memory enhancement kits for fax machines. Sales have been very erratic, with some months showing a profit and some months showing a loss. The company's income statement for the most recent month is given below:

Sales (13,500 units at \$20 per unit)	\$ 270,000
Less variable expenses	<u>189,000</u>
Contribution margin	81,000
Less fixed expenses	<u>90,000</u>
Net operating loss	\$ (9,000)



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Required:

1. Compute the company's CM ratio and its break-even point in both units and dollars.
2. The sales manager feels that an \$8,000 increase in the monthly advertising budget, combined with an intensified effort by the sales staff, will result in a \$70,000 increase in monthly sales. If the sales manager is right, what will be the effect on the company's monthly net operating income or loss? (Use the incremental approach in preparing your answer.)
3. The president is convinced that a 10% reduction in the selling price, combined with an increase of \$35,000 in the monthly advertising budget, will cause unit sales to double. What will the new income statement look like if these changes are adopted?
4. Refer to the original data. The company's advertising agency thinks that a new package would help sales. The new package being proposed would increase packaging costs by \$0.60 per unit. Assuming no other changes, how many units would have to be sold each month to earn a profit of \$4,500?
5. Refer to the original data. By automating certain operations, the company could slash its variable expenses in half. However, fixed costs would increase by \$118,000 per month.
 - a. Compute the new CM ratio and the new break-even point in both units and dollars.
 - b. Assume that the company expects to sell 20,000 units next month. Prepare two income statements, one assuming that operations are not automated and one assuming that they are.
 - c. Would you recommend that the company automate its operations? Explain.

PROBLEM 6-10 Basic CVP Analysis; Graphing [LO1, LO2, LO4, LO5]

Shirts Unlimited operates a chain of shirt stores around the country. The stores carry many styles of shirts that are all sold at the same price. To encourage sales personnel to be aggressive in their sales efforts, the company pays a substantial sales commission on each shirt sold. Sales personnel also receive a small basic salary.

The following worksheet contains cost and revenue data for Store 36. These data are typical of the company's many outlets:

A	B	C
	Per Shirt	
1	\$ 40.00	
2	Selling price	
3		
4	Variable expenses:	
5	Invoice cost	\$ 18.00
6	Sales commission	7.00
7	Total variable expenses	\$ 25.00
8		
9		Annual
10	Fixed expenses:	
11	Rent	\$ 80,000
12	Advertising	150,000
13	Salaries	70,000
14	Total fixed expenses	\$300,000
15		

Shirts Unlimited is a fairly new organization. The company has asked you, as a member of its planning group, to assist in some basic analysis of its stores and company policies.

Required:

1. Calculate the annual break-even point in dollar sales and in unit sales for Store 36.
2. Prepare a CVP graph showing cost and revenue data for Store 36 from a zero level of activity up to 30,000 shirts sold each year. Clearly indicate the break-even point on the graph.
3. If 19,000 shirts are sold in a year, what would be Store 36's net operating income or loss?
4. The company is considering paying the store manager of Store 36 an incentive commission of \$3 per shirt (in addition to the salespersons' commissions). If this change is made, what will be the new break-even point in dollar sales and in unit sales?
5. Refer to the original data. As an alternative to (4) above, the company is considering paying the store manager a \$3 commission on each shirt sold in excess of the break-even point. If this change is made, what will be the store's net operating income or loss if 23,500 shirts are sold in a year?

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6. Refer to the original data. The company is considering eliminating sales commissions entirely in its stores and increasing fixed salaries by \$107,000 annually.
- If this change is made, what will be the new break-even point in dollar sales and in unit sales in Store 36?
 - Would you recommend that the change be made? Explain.

PROBLEM 6-11 Sales Mix; Multiproduct Break-Even Analysis [LO9]

Marlin Company has been operating for only a few months. The company sells three products—sinks, mirrors, and vanities. Budgeted sales by product and in total for the coming month are shown below:



	Product						Total
	Sinks		Mirrors		Vanities		
Percentage of total sales	48%	20%	32%				
Sales	\$240,000	100%	\$100,000	100%	\$160,000	100%	100%
Less variable expenses	72,000	30	80,000	80	88,000	55	240,000
Contribution margin	<u>\$168,000</u>	<u>70%</u>	<u>\$ 20,000</u>	<u>20%</u>	<u>\$ 72,000</u>	<u>45%</u>	<u>260,000</u>
Less fixed expenses							223,600
Net operating income							<u>\$ 36,400</u>

$$\text{Break-even point} = \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\$223,600}{0.52} = \$430,000$$

As shown by these data, net operating income is budgeted at \$36,400 for the month, and break-even sales at \$430,000.

Assume that actual sales for the month total \$500,000 as planned. Actual sales by product are: sinks, \$160,000; mirrors, \$200,000; and vanities, \$140,000.

Required:

- Prepare a contribution income statement for the month based on actual sales data. Present the income statement in the format shown above.
- Compute the break-even sales for the month, based on your actual data.
- Considering the fact that the company met its \$500,000 sales budget for the month, the president is shocked at the results shown on your income statement in (1) above. Prepare a brief memo for the president explaining why both the operating results and break-even sales are different from what was budgeted.

PROBLEM 6-12 Basic CVP Analysis [LO1, LO3, LO4, LO5, LO8]

Stratford Company distributes a lightweight lawn chair that sells for \$15 per unit. Variable costs are \$6 per unit, and fixed costs total \$180,000 annually.



Required:

Answer the following independent questions:

- What is the product's CM ratio?
- Use the CM ratio to determine the break-even point in sales dollars.
- The company estimates that sales will increase by \$45,000 during the coming year due to increased demand. By how much should net operating income increase?
- Assume that the operating results for last year were as follows:

Sales	\$360,000
Less variable expenses	144,000
Contribution margin	216,000
Less fixed expenses	180,000
Net operating income	<u>\$ 36,000</u>

- Compute the degree of operating leverage at the current level of sales.
- The president expects sales to increase by 15% next year. By how much should net income increase?
- Refer to the original data. Assume that the company sold 28,000 units last year. The sales manager is convinced that a 10% reduction in the selling price, combined with a \$70,000 increase

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Chapter Nine

LEARNING OBJECTIVES

After studying Chapter 9, you should be able to:

1. Understand why organizations budget and the processes they use to create budgets.
2. Prepare a sales budget, including a schedule of expected cash receipts.
3. Prepare a production budget.
4. Prepare a direct materials budget, including a schedule of expected cash disbursements for purchases of materials.
5. Prepare a direct labor budget.
6. Prepare a manufacturing overhead budget.
7. Prepare a selling and administrative expense budget.
8. Prepare a cash budget.
9. Prepare a budgeted income statement.
10. Prepare a budgeted balance sheet.

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In this chapter, we focus on the steps taken by businesses to achieve their desired levels of profits—a process that can be called *profit planning*. We shall see that profit planning is accomplished through the preparation of a number of budgets, which, when brought together, form an integrated business plan known as the *master budget*. The master budget is an essential management tool that communicates management's plans throughout the organization, allocates resources, and coordinates activities.

The Basic Framework of Budgeting

LEARNING OBJECTIVE 1

Understand why organizations budget and the processes they use to create budgets.

A budget is a detailed plan for acquiring and using financial and other resources over a specified time period. It represents a plan for the future expressed in formal quantitative terms. The act of preparing a budget is called *budgeting*. The use of budgets to control a firm's activities is known as *budgetary control*.

The **master budget** is a summary of a company's plans that sets specific targets for sales, production, distribution, and financing activities. It generally culminates in a cash budget, a budgeted income statement, and a budgeted balance sheet. In short, it represents a comprehensive expression of management's plans for the future and how these plans are to be accomplished.

Personal Budgets

Nearly everyone budgets to some extent, even though many of the people who use budgets do not recognize what they are doing as budgeting. For example, most people make estimates of their income and plan expenditures for food, clothing, housing, and so on. As a result of this planning, people restrict their spending to some predetermined, allowable amount. While they may not be conscious of the fact, these people clearly go through a budgeting process. Income is estimated, expenditures are planned, and spending is restricted in accordance with the plan. Individuals also use budgets to forecast their future financial condition for purposes such as purchasing a home, financing college education, or setting aside funds for retirement. These budgets may exist only in the mind of the individual, but they are budgets nevertheless.

The budgets of a business or other organization serve much the same functions as the budgets prepared informally by individuals. Business budgets tend to be more detailed and to involve more work, but they are similar to the budgets prepared by individuals in most other respects. Like personal budgets, they assist in planning and controlling expenditures; they also assist in predicting operating results and financial condition in future periods.

Difference between Planning and Control

The terms *planning* and *control* are often confused, and occasionally these terms are used in such a way as to suggest that they mean the same thing. Actually, planning and control are two quite distinct concepts. Planning involves developing objectives and preparing various budgets to achieve those objectives. Control involves the steps taken by management to increase the likelihood that the objectives set down at the planning stage are attained and that all parts of the organization are working together toward that goal. To be completely effective, a good budgeting system must provide for both planning and control. Good planning without effective control is time wasted.

Advantages of Budgeting

Companies realize many benefits from a budgeting program. Among these benefits are the following:

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1. Budgets provide a means of *communicating* management's plans throughout the organization.
2. Budgets force managers to *think about* and plan for the future. In the absence of the necessity to prepare a budget, many managers would spend all of their time dealing with daily emergencies.
3. The budgeting process provides a means of *allocating resources* to those parts of the organization where they can be used most effectively.
4. The budgeting process can uncover potential *bottlenecks* before they occur.
5. Budgets *coordinate* the activities of the entire organization by *integrating* the plans of the various parts. Budgeting helps to ensure that everyone in the organization is pulling in the same direction.
6. Budgets define goals and objectives that can serve as *benchmarks* for evaluating subsequent performance.

Bringing Order Out of Chaos

In Business



Consider the following situation encountered by one of the authors at a mortgage banking firm. For years, the company operated with virtually no system of budgets whatever. Management contended that budgeting wasn't well suited to the firm's type of operation. Moreover, management pointed out that the firm was already profitable. Indeed, outwardly the company gave every appearance of being a well-managed, smoothly operating organization. A careful look within, however, disclosed that day-to-day operations were far from smooth, and often approached chaos. The average day was nothing more than an exercise in putting out one brush fire after another. The Cash account was always at crisis levels. At the end of a day, no one ever knew whether enough cash would be available the next day to cover required loan closings. Departments were uncoordinated, and it was not uncommon to find that one department was pursuing a course that conflicted with the course pursued by another department. Employee morale was low, and turnover was high. Employees complained bitterly that when a job was well done, nobody ever knew about it.

The company was bought out by a new group of stockholders who required that an integrated budgeting system be established to control operations. Within one year's time, significant changes were evident. Brush fires were rare. Careful planning virtually eliminated the problems that had been experienced with cash, and departmental efforts were coordinated and directed toward predetermined overall company goals. Although the employees were wary of the new budgeting program initially, they became "converted" when they saw the positive effects that it brought about. The more efficient operations caused profits to jump dramatically. Communication increased throughout the organization. When a job was well done, everybody knew about it. As one employee stated, "For the first time, we know what the company expects of us."

Responsibility Accounting

Most of what we say in this chapter and in the next three chapters is concerned with *responsibility accounting*. The basic idea behind responsibility accounting is that a manager should be held responsible for those items—and *only* those items—that the manager can actually control to a significant extent. Each line item (i.e., revenue or cost) in the budget is made the responsibility of a manager, and that manager is held responsible for subsequent deviations between budgeted goals and actual results. In effect, responsibility accounting *personalizes* accounting information by looking at costs from a *personal control* standpoint. This concept is central to any effective profit planning and control system. Someone must be held responsible for each cost or else no one will be responsible, and the cost will inevitably grow out of control.

Being held responsible for costs does not mean that the manager is penalized if the actual results do not measure up to the budgeted goals. However, the manager should take

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The Politics of Budgeting

Budgeting is often an intensely political process in which managers jockey for resources and relaxed goals for the upcoming year. One group of consultants describes the process in this way. Annual budgets "have a particular urgency in that they provide the standard and most public framework against which managers are assessed and judged. It is, therefore, not surprising that budget-setting is taken seriously . . . Often budgets are a means for managers getting what they want. A relaxed budget will secure a relatively easy twelve months, a tight one means that their names will constantly be coming up in the monthly management review meeting. Far better to shift the burden of cost control and financial discipline to someone else. Budgeting is an intensely political exercise conducted with all the sharper managerial skills not taught at business school, such as lobbying and flattering superiors, forced haste, regretted delay, hidden truth, half-truths, and lies."

Source: Michael Morrow, ed., *Activity-Based Management* (New York: Woodhead-Faulkner), p. 91.

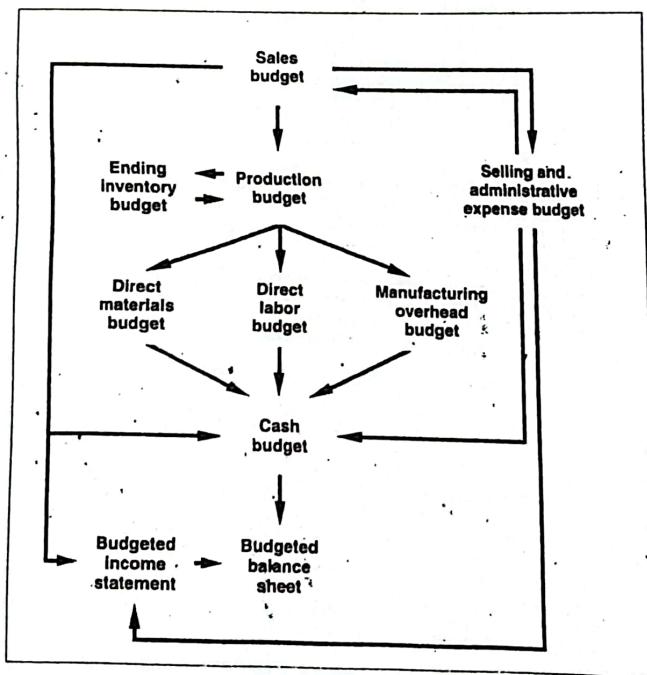
The Master Budget: An Overview

The master budget consists of a number of separate but interdependent budgets. Exhibit 9-2 provides an overview of the various parts of the master budget and how they are related.

Exhibit 9-2
The Master Budget
Interrelationships



Concept 9-1



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Concentrating on the Cash Flow

In Business

Burlington Northern Santa Fe (BNSF) operates the second largest railroad in the United States. The company's senior vice president, CFO, and treasurer is Tom Hunt, who reports that "As a general theme, we've become very cash-flow-oriented." After the merger of the Burlington Northern and Santa Fe railroads, the company went through a number of years in which they were investing heavily and consequently had negative cash flows. To keep on top of the company's cash position, Hunt has a cash forecast prepared every month. "Everything falls like dominoes from free cash flow," Hunt says. "It provides us with alternatives. Right now, the alternative of choice is buying back our own stock... [but] it could be increasing dividends or making acquisitions. All those things are not even on the radar screen if you don't have free cash flow."

Source: Randy Myers, "Cash Crop: The 2000 Working Capital Survey," CFO, August 2000, pp. 59-82.



The cash budget is composed of four major sections:

1. The receipts section.
2. The disbursements section.
3. The cash excess or deficiency section.
4. The financing section.

The receipts section consists of a listing of all of the cash inflows, except for financing, expected during the budget period. Generally, the major source of receipts will be from sales.

The disbursements section consists of all cash payments that are planned for the budget period. These payments will include raw materials purchases, direct labor payments, manufacturing overhead costs, and so on, as contained in their respective budgets. In addition, other cash disbursements such as equipment purchases, dividends, and other cash withdrawals by owners are listed.

The cash excess or deficiency section is computed as follows:

Cash balance, beginning	XXXX
Add receipts	XXXX
Total cash available	XXXX
Less disbursements	XXXX
Excess (deficiency) of cash available over disbursements	<u>XXXX</u>

If there is a cash deficiency during any budget period, the company will need to borrow funds. If there is a cash excess during any budget period, funds borrowed in previous periods can be repaid or the excess funds can be invested.

The financing section details the borrowings and repayments projected to take place during the budget period. It also includes interest payments that will be due on money borrowed.¹

Generally speaking, the cash budget should be broken down into time periods that are as short as feasible. Considerable fluctuations in cash balances may be hidden by looking at a longer time period. While a monthly cash budget is most common, many firms budget cash on a weekly or even daily basis. Larry Giuno has prepared a quarterly cash budget for Hampton Freeze that can be further refined as necessary. This budget appears in

¹ The format for the statement of cash flows, which is discussed in Chapter 16, may also be used for the cash budget.

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In Business

Automating the Budgeting Process

A number of companies, including Texaco, Fujitsu, Sprint, Nationwide Financial Services, Nortel Networks, Owens Corning, and Xilinx have been attempting to reengineer and automate the budgeting process. The goal is to eliminate the conventional iterative budgeting process that often finds preliminary budgets being passed up and down the management hierarchy many times before final agreement is reached—wasting much time and resulting in budgets that often don't reconcile. Apart from the tremendous technical challenges of integrating diverse budgets from many different operations, automation faces a high behavioral hurdle. As Greg Vesey of Texaco states, "Planning is the most political of all processes to fall under the finance function." Consequently, as many as half of all automation efforts fail. Companies such as National Semiconductor Corp. have given up entirely and have returned to their old budgeting methods.

Source: Russ Banham, "The Revolution in Planning," *CFO*, August 1999, pp. 46-56.

Planning quarter
Prepare for next
Required:
1. A sales budget
2. A production budget
3. A direct materials purchase budget
Solds

Summary

This chapter presents an overview of the budgeting process and shows how the various operating budgets relate to each other. The sales budget forms the foundation for profit planning. Once the sales budget has been set, the production budget and the selling and administrative budget can be prepared since they depend on how many units are to be sold. The production budget determines how many units are to be produced, so after it is prepared, the various manufacturing cost budgets can be prepared. All of these various budgets feed into the cash budget and the budgeted income statement and balance sheet. There are many connections between these various parts of the master budget. For example, the schedule of expected cash collections, which is completed in connection with the sales budget, provides data for both the cash budget and the budgeted balance sheet.

The material in this chapter is just an introduction to budgeting and profit planning. In later chapters, we will see how budgets are used to control day-to-day operations and how they are used in performance evaluation.

Review Problem: Budget Schedules

Myler Company manufactures and sells a product that has seasonal variations in demand, with peak sales coming in the third quarter. The following information concerns operations for Year 2—the coming year—and for the first two quarters of Year 3:

- The company's single product sells for \$8 per unit. Budgeted sales in units for the next six quarters are as follows:
- | | Year 2 Quarter | | | | Year 3 Quarter | |
|------------------------------------|----------------|--------|---------|--------|----------------|--------|
| | 1 | 2 | 3 | 4 | 1 | 2 |
| Budgeted sales in units, | 40,000 | 60,000 | 100,000 | 50,000 | 70,000 | 80,000 |
- Sales are collected in the following pattern: 75% in the quarter the sales are made, and the remaining 25% in the following quarter. On January 1, Year 2, the company's balance sheet showed \$65,000 in accounts receivable, all of which will be collected in the first quarter of the year. Bad debts are negligible and can be ignored.
 - The company desires an ending inventory of finished units on hand at the end of each quarter equal to 30% of the budgeted sales for the next quarter. On December 31, Year 1, the company had 12,000 units on hand.
 - Five pounds of raw materials are required to complete one unit of product. The company requires an ending inventory of raw materials on hand at the end of each quarter equal to 10% of the production needs of the following quarter. On December 31, Year 1, the company had 23,000 pounds of raw materials on hand.
 - The raw material costs \$0.80 per pound. Purchases of raw material are paid for in the following pattern: 60% paid in the quarter the purchases are made, and the remaining 40% paid in the fol-

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l owing quarter. On January 1, Year 2, the company's balance sheet showed \$81,500 in accounts payable for raw material purchases, all of which will be paid for in the first quarter of the year.

Required: Prepare the following budgets and schedules for the year, showing both quarterly and total figures:

1. A sales budget and a schedule of expected cash collections.

2. A production budget.

3. A direct materials purchases budget and a schedule of expected cash payments for material purchases.

Solution to Review Problem

- The sales budget is prepared as follows:

	Year 2 Quarter				Year
	1	2	3	4	
Budgeted sales in units	40,000	60,000	100,000	50,000	250,000
Selling price per unit	x \$8				
Total sales	<u>\$320,000</u>	<u>\$480,000</u>	<u>\$800,000</u>	<u>\$400,000</u>	<u>\$2,000,000</u>

Based on the budgeted sales above, the schedule of expected cash collections is prepared as follows:

	Year 2 Quarter				Year
	1	2	3	4	
Accounts receivable, beginning balance	\$ 65,000				\$ 65,000
First-quarter sales (\$320,000 × 75%, 25%)	240,000	\$ 80,000			320,000
Second-quarter sales (\$480,000 × 75%, 25%)		360,000	\$120,000		480,000
Third-quarter sales (\$800,000 × 75%, 25%)			600,000	\$200,000	800,000
Fourth-quarter sales (\$400,000 × 75%).				300,000	300,000
Total cash collections	<u>\$305,000</u>	<u>\$440,000</u>	<u>\$720,000</u>	<u>\$500,000</u>	<u>\$1,965,000</u>

- Based on the sales budget in units, the production budget is prepared as follows:

	Year 2 Quarter				Year 3 Quarter	
	1	2	3	4	Year	1
Budgeted sales (units)	40,000	60,000	100,000	50,000	250,000	70,000
Add desired ending inventory of finished goods*	18,000	30,000	15,000	21,000 [†]	21,000	24,000
Total needs	58,000	90,000	115,000	71,000	271,000	94,000
Less beginning inventory of finished goods	12,000	18,000	30,000	15,000	12,000	21,000
Required production	<u>46,000</u>	<u>72,000</u>	<u>85,000</u>	<u>56,000</u>	<u>259,000</u>	<u>73,000</u>

*30% of the following quarter's budgeted sales in units.

[†]30% of the budgeted Year 3 first-quarter sales.

- Based on the production budget figures, raw materials will need to be purchased as follows during the year:

	Year 2 Quarter				Year 3 Quarter	
	1	2	3	4	Year 2	1
Required production (units)	46,000	72,000	85,000	56,000	259,000	73,000
Raw materials needed per unit (pounds)	x 5	x 5	x 5	x 5	x 5	x 5
Production needs (pounds)	230,000	360,000	425,000	280,000	1,295,000	365,000
Add desired ending inventory of raw materials (pounds)*	36,000	42,500	28,000	36,500 [†]	36,500	
Total needs (pounds)	266,000	402,500	453,000	316,500	1,331,500	
Less beginning inventory of raw materials (pounds)	23,000	36,000	42,500	28,000	23,000	
Raw materials to be purchased (pounds)	<u>243,000</u>	<u>366,500</u>	<u>410,500</u>	<u>288,500</u>	<u>1,308,500</u>	

*Ten percent of the following quarter's production needs in pounds.

[†]Ten percent of the Year 3 first-quarter production needs in pounds.

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243,000 x 0.80

Based on the raw material purchases above, expected cash payments are computed as follows:

	Year 2 Quarter				Year 2
	1	2	3	4	
Cost of raw materials to be purchased at \$0.80 per pound.....	\$194,400	\$293,200	\$328,400	\$230,800	\$1,046,800
Accounts payable, beginning balance.....	\$ 81,500				\$81,500
First-quarter purchases (\$194,400 x 60%, 40%).....	116,640	\$ 77,760	\$ 117,280		194,400
Second-quarter purchases (\$293,200 x 60%, 40%).....		175,920	197,040	\$131,360	293,200
Third-quarter purchases (\$328,400 x 60%, 40%).....				138,480	328,400
Fourth-quarter purchases (\$230,800 x 60%).....					138,480
Total cash disbursements	\$198,140	\$253,680	\$314,320	\$269,840	\$1,035,980

Glossary

- Budget** A detailed plan for the acquisition and use of financial and other resources over a specified time period. (p. 374)
- Budget committee** A group of key management persons who are responsible for overall policy matters relating to the budget program and for coordinating the preparation of the budget. (p. 380)
- Cash budget** A detailed plan showing how cash resources will be acquired and used over some specific time period. (p. 382)
- Continuous budget** A 12-month budget that rolls forward one month as the current month is completed. (p. 376)
- Control** Those steps taken by management that attempt to increase the likelihood that the objectives set down at the planning stage are attained and that all parts of the organization are working together toward that goal. (p. 374)
- Direct labor budget** A detailed plan showing labor requirements over some specific time period. (p. 389)
- Direct materials budget** A detailed plan showing the amount of raw materials that must be purchased during a period to meet both production and inventory needs. (p. 387)
- Ending finished goods inventory budget** A budget showing the dollar amount of cost expected to appear on the balance sheet for unsold units at the end of a period. (p. 391)
- Manufacturing overhead budget** A detailed plan showing the production costs, other than direct materials and direct labor, that will be incurred over a specified time period. (p. 389)
- Master budget** A summary of a company's plans in which specific targets are set for sales, production, distribution, and financing activities and that generally culminates in a cash budget, budgeted income statement, and budgeted balance sheet. (p. 374)
- Material requirements planning (MRP)** An operations management tool that uses a computer to help manage materials and inventories. (p. 387)
- Merchandise purchases budget** A budget used by a merchandising company that shows the amount of goods that must be purchased from suppliers during the period. (p. 387)
- Participative budget** See *Self-imposed budget*. (p. 377)
- Perpetual budget** See *Continuous budget*. (p. 376)
- Planning** Developing objectives and preparing budgets to achieve those objectives. (p. 374)
- Production budget** A detailed plan showing the number of units that must be produced during a period in order to meet both sales and inventory needs. (p. 385)
- Responsibility accounting** A system of accountability in which managers are held responsible for those items of revenue and cost—and only those items—over which the manager can exert significant control. The managers are held responsible for differences between budgeted and actual results. (p. 375)
- Sales budget** A detailed schedule showing the expected sales for coming periods; these sales are typically expressed in both dollars and units. (p. 382)
- Self-imposed budget** A method of preparing budgets in which managers prepare their own budgets. These budgets are then reviewed by the manager's supervisor, and any issues are resolved by mutual agreement. (p. 377)
- Selling and administrative expense budget** A detailed schedule of planned expenses that will be incurred in areas other than manufacturing during a budget period. (p. 391)
- Zero-based budget** A method of budgeting in which managers are required to justify all costs as if the programs involved were being proposed for the first time. (p. 380)

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as follows:

Questions

- 9-1 What is a budget? What is budgetary control?
- 9-2 Discuss some of the major benefits to be gained from budgeting.
- 9-3 What is meant by the term *responsibility accounting*?
- 9-4 What is a master budget? Briefly describe its contents.
- 9-5 Why is the sales forecast the starting point in budgeting?
- 9-6 "As a practical matter, planning and control mean exactly the same thing." Do you agree? Explain.
- 9-7 Describe the flow of budget data in an organization. Who are the participants in the budgeting process, and how do they participate?
- 9-8 What is a self-imposed budget? What are the major advantages of self-imposed budgets?
- 9-9 What caution must be exercised in their use?
- 9-10 How can budgeting assist a firm in its employment policies?
- 9-11 "The principal purpose of the cash budget is to see how much cash the company will have in the bank at the end of the year." Do you agree? Explain.
- 9-12 How does zero-based budgeting differ from traditional budgeting?

Exercises

✓ EXERCISE 9-1 Schedule of Expected Cash Collections [LO2]
Peak sales for Midwest Products, Inc., occur in August. The company's sales budget for the third quarter showing these peak sales is given below:

	July	August	September	Total
Budgeted sales	\$600,000	\$900,000	\$500,000	\$2,000,000

From past experience, the company has learned that 20% of a month's sales are collected in the month of sale, that another 70% is collected in the month following sale, and that the remaining 10% is collected in the second month following sale. Bad debts are negligible and can be ignored. May sales totaled \$430,000, and June sales totaled \$540,000.

Required:

1. Prepare a schedule of expected cash collections from sales, by month and in total, for the third quarter.
2. Assume that the company will prepare a budgeted balance sheet as of September 30. Compute the accounts receivable as of that date.

✓ EXERCISE 9-2 Production Budget [LO3]
Crystal Telecom has budgeted the sales of its innovative mobile phone over the next four months as follows:

	Sales In Units
July	30,000
August	45,000
September	60,000
October	50,000

The company is now in the process of preparing a production budget for the third quarter. Past experience has shown that end-of-month inventories of finished goods must equal 10% of the next month's sales. The inventory at the end of June was 3,000 units.

Required:
Prepare a production budget for the third quarter showing the number of units to be produced each month and for the quarter in total.

✓ EXERCISE 9-3 Materials Purchases Budget [LO4]
Micro Products, Inc., has developed a very powerful electronic calculator. Each calculator requires three small "chips" that cost \$2 each and are purchased from an overseas supplier. Micro Products has prepared a production budget for the calculator by quarters for Year 2 and for the first quarter of Year 3, as shown on the next page:

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	Year 2				Year 3
	First	Second	Third	Fourth	First
Budgeted production, in calculators	60,000	90,000	150,000	100,000	80,000

The chip used in production of the calculator is sometimes hard to get, so it is necessary to carry large inventories as a precaution against stockouts. For this reason, the inventory of chips at the end of a quarter must be equal to 20% of the following quarter's production needs. Some 36,000 chips will be on hand to start the first quarter of Year 2.

Required:

Prepare a materials purchases budget for chips, by quarter and in total, for Year 2. At the bottom of your budget, show the dollar amount of purchases for each quarter and for the year in total.

EXERCISE 9-4 Direct Labor Budget [LO5]

The Production Department of the Riverside Plant of Juinen Corporation has submitted the following forecast of units to be produced at the plant for each quarter of the upcoming fiscal year. The plant produces high-end outdoor barbecue grills.

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Units to be produced	5,000	4,400	4,500	4,900

Each unit requires 0.40 direct labor-hours and direct labor-hour workers are paid \$11 per hour.

Required:

1. Construct the company's direct labor budget for the upcoming fiscal year, assuming that the direct labor work force is adjusted each quarter to match the number of hours required to produce the forecasted number of units produced.
2. Construct the company's direct labor budget for the upcoming fiscal year, assuming that the direct labor work force is *not* adjusted each quarter. Instead, assume that the company's direct labor work force consists of permanent employees who are guaranteed to be paid for at least 1,800 hours of work each quarter. If the number of required direct labor-hours is less than this number, the workers are paid for 1,800 hours anyway. Any hours worked in excess of 1,800 hours in a quarter are paid at the rate of 1.5 times the normal hourly rate for direct labor.

EXERCISE 9-5 Manufacturing Overhead Budget [LO6]

The direct labor budget of Krispin Corporation for the upcoming fiscal year contains the following details concerning budgeted direct labor-hours.

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Budgeted direct labor-hours	5,000	4,800	5,200	5,400

The company's variable manufacturing overhead rate is \$1.75 per direct labor-hour and the company's fixed manufacturing overhead is \$35,000 per quarter. The only noncash item included in the fixed manufacturing overhead is depreciation, which is \$15,000 per quarter.

Required:

1. Construct the company's manufacturing overhead budget for the upcoming fiscal year.
2. Compute the company's manufacturing overhead rate (including both variable and fixed manufacturing overhead) for the upcoming fiscal year. Round off to the nearest whole cent.

EXERCISE 9-6 Selling and Administrative Budget [LO7]

The budgeted unit sales of Haerve Company for the upcoming fiscal year are provided below:

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Budgeted unit sales	12,000	14,000	11,000	10,000

The company's variable selling and administrative expenses per unit are \$2.75. Fixed selling and administrative expenses include advertising expenses of \$12,000 per quarter, executive salaries of \$40,000 per quarter, and depreciation of \$16,000 per quarter. In addition, the company will make insurance payments of \$6,000 in the 2nd Quarter and \$6,000 in the 4th Quarter. Finally, property taxes of \$6,000 will be paid in the 3rd Quarter.

Required:

Prepare the company's selling and administrative expense budget for the upcoming fiscal year.

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How did the company approach the way Xanadu and Cross went about preparing the master budget?

(CMA, adapted)

PROBLEM 9-9 Schedules of Expected Cash Collections and Disbursements

[LO2, LO4, LO8]

Calgon Products, a distributor of organic beverages, needs a cash budget for September. The following information is available:

- The cash balance at the beginning of September is \$9,000.
- Actual sales for July and August and expected sales for September are as follows:

	July	August	September
Cash sales	\$ 6,500	\$ 5,250	\$ 7,400
Sales on account	20,000	30,000	40,000
Total sales	<u>\$26,500</u>	<u>\$35,250</u>	<u>\$47,400</u>

Sales on account are collected over a three-month period in the following ratio: 10% collected in the month of sale, 70% collected in the month following sale, and 18% collected in the second month following sale. The remaining 2% is uncollectible.

- Purchases of inventory will total \$25,000 for September. Twenty percent of a month's inventory purchases are paid for during the month of purchase. The accounts payable remaining from August's inventory purchases total \$16,000, all of which will be paid in September.
- Selling and administrative expenses are budgeted at \$13,000 for September. Of this amount, \$4,000 is for depreciation.
- Equipment costing \$18,000 will be purchased for cash during September, and dividends totaling \$3,000 will be paid during the month.
- The company must maintain a minimum cash balance of \$5,000. An open line of credit is available from the company's bank to bolster the cash position as needed.

Required:

- Prepare a schedule of expected cash collections for September.
- Prepare a schedule of expected cash disbursements during September for inventory purchases.
- Prepare a cash budget for September. Indicate in the financing section any borrowing that will be needed during September.

PROBLEM 9-10 Production and Purchases Budgets [LO3, LO4]

Tonga Toys manufactures and distributes a number of products to retailers. One of these products, Playclay, requires three pounds of material A135 in the manufacture of each unit. The company is now planning raw materials needs for the third quarter—July, August, and September. Peak sales of Playclay occur in the third quarter of each year. To keep production and shipments moving smoothly, the company has the following inventory requirements:

- The finished goods inventory on hand at the end of each month must be equal to 5,000 units plus 30% of the next month's sales. The finished goods inventory on June 30 is budgeted to be 17,000 units.
- The raw materials inventory on hand at the end of each month must be equal to one-half of the following month's production needs for raw materials. The raw materials inventory on June 30 for material A135 is budgeted to be 64,500 pounds.
- The company maintains no work in process inventories.

A sales budget for Playclay for the last six months of the year follows:

Budgeted Sales In Units	
July	40,000
August	50,000
September	70,000
October	35,000
November	20,000
December	10,000

Required:

- Prepare a production budget for Playclay for the months July, August, September, and October.
- Examine the production budget that you prepared. Why will the company produce more units than it sells in July and August and less units than it sells in September and October?

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3. Prepare a budget showing the quantity of material A135 to be purchased for July, August, and September and for the quarter in total.

PROBLEM 9-11 Direct Materials and Direct Labor Budgets [LO4, LO5]

The production department of Priston Company has submitted the following forecast of units to be produced by quarter for the upcoming fiscal year.

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Units to be produced	6,000	7,000	8,000	5,000

In addition, the beginning raw materials inventory for the 1st Quarter is budgeted to be 3,600 pounds and the beginning accounts payable for the 1st Quarter is budgeted to be \$11,775.

Each unit requires three pounds of raw material that costs \$2.50 per pound. Management desires to end each quarter with an inventory of raw materials equal to 20% of the following quarter's production needs. The desired ending inventory for the 4th Quarter is 3,700 pounds. Management plans to pay for 70% of raw material purchases in the quarter acquired and 30% in the following quarter. Each unit requires 0.50 direct labor-hour and direct labor-hour workers are paid \$12 per hour.

Required:

1. Prepare the company's direct materials budget and schedule of expected cash disbursements for materials for the upcoming fiscal year.
2. Prepare the company's direct labor budget for the upcoming fiscal year, assuming that the direct labor work force is adjusted each quarter to match the number of hours required to produce the forecasted number of units produced.

PROBLEM 9-12 Direct Labor and Manufacturing Overhead Budgets [LO5, LO6]

The Production Department of Harveton Corporation has submitted the following forecast of units to be produced by quarter for the upcoming fiscal year.

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Units to be produced	16,000	15,000	14,000	15,000

Each unit requires 0.80 direct labor-hours and direct labor-hour workers are paid \$11.50 per hour.

In addition, the variable manufacturing overhead rate is \$2.50 per direct labor-hour. The fixed manufacturing overhead is \$90,000 per quarter. The only noncash element of manufacturing overhead is depreciation, which is \$74,000 per quarter.

Required:

1. Prepare the company's direct labor budget for the upcoming fiscal year, assuming that the direct labor work force is adjusted each quarter to match the number of hours required to produce the forecasted number of units produced.
2. Prepare the company's manufacturing overhead budget.

PROBLEM 9-13 Cash Budget; Income Statement; Balance Sheet [LO2, LO4, LO8, LO9, LO10]

The balance sheet of Phototec, Inc., a distributor of photographic supplies, as of May 31 is given below:

PHOTOTEC, INC. Balance Sheet May 31	
Assets	
Cash	\$ 8,000
Accounts receivable	72,000
Inventory	30,000
Buildings and equipment, net of depreciation	500,000
Total assets	<u><u>\$610,000</u></u>
Liabilities and Stockholders' Equity	
Accounts payable, suppliers	\$ 90,000
Note payable	15,000
Capital stock, no par	420,000
Retained earnings	85,000
Total liabilities and stockholders' equity	<u><u>\$610,000</u></u>

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