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An Introduction to Cost Terms and Purposes

Learning Objectives

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

What does the word *cost* mean to you?

Is it the price you pay for something of value, like a cell phone? A cash outflow, like monthly rent? Something that affects profitability, like salaries? Organizations, like individuals, deal with different types of costs. At different times organizations put more or less emphasis on these costs. When times are good, companies often focus on selling as much as they can, with costs taking a backseat. But when times get tough, companies shift their emphasis from selling to cutting costs. Unfortunately, when times are really bad, companies may find that they are unable to cut costs fast enough, leading to Chapter 11 bankruptcy, as was the case with Hostess Brands.

High Fixed Costs Bankrupt Twinkie Maker¹

In 2012, Hostess Brands—owner of the iconic Twinkies lunchbox snack—announced it would go out of business and liquidate its assets. Declining sales and trends toward healthier snacking crippled the company given its high fixed costs—costs that did not decrease as the number of Twinkies and Ho Hos sold declined.

After emerging from bankruptcy in 2009, Hostess management tried to turn around the company's fortunes through innovation and workplace efficiency. Despite initial progress reducing its variable costs, the prices of the commodities that Hostess relied on—corn, sugar, and flour—increased during the recession. Unfortunately for Hostess, the remaining large percentage of its operating costs were fixed because union contracts made it difficult to close facilities, consolidate distribution routes, or reduce pensions owed to retired workers.

By the second half of 2011, Hostess was losing \$2 million per week. With a stifling debt burden, the company filed for bankruptcy protection again in January 2012. Further cost reductions proved elusive and controversial negotiations with unions resulted in thousands of employees striking that November. Within days, Hostess collapsed under the weight of its fixed costs and filed to liquidate its assets. The wind down resulted in the closure of 33 bakeries, 565 distribution centers, about 5,500 delivery routes, and 570 bakery outlet stores and the loss of 18,500 jobs.

As the story of Hostess Brands illustrates, managers must understand their firms' costs and closely manage them. Organizations as varied as the United Way, the Mayo

¹ Sources: David A. Kaplan, "Hostess is Bankrupt... Again," *Fortune* (July 26, 2012); Rachel Feintzing, Mike Spector, and Julie Jargon, "Twinkie Maker Hostess to Close," *The Wall Street Journal* (November 16, 2012); "Hostess Brands Obtains Court Authority to Wind Down All Operations, Liquidate Assets, Hostess Brands press release (Irving, TX, November 21, 2012).



Clinic, and Sony generate reports containing a variety of cost concepts and terms managers need to understand to effectively use the reports to run their businesses. This chapter discusses cost concepts and terms that are the basis of accounting information used for internal and external reporting.

Costs and Cost Terminology

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

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

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

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

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

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

Learning Objective 1

Define and illustrate a cost object

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

Decision Point

What is the cost object?

Exhibit 2-1 Examples of Cost Objects at BMW

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

Learning Objective 2

Distinguish between direct costs
 ... costs that are traced to the cost object
 and indirect costs
 ... costs that are allocated to the cost object

Direct Costs and Indirect Costs

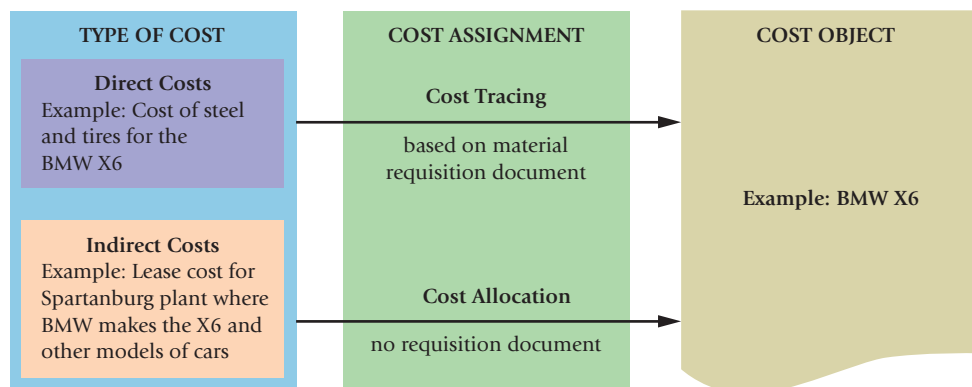
We now describe how costs are classified as direct and indirect costs and the methods used to assign these costs to cost objects.

- Direct costs of a cost object** are related to the particular cost object and can be traced to it in an economically feasible (cost-effective) way. For example, the cost of steel or tires is a direct cost of BMW X6s. The cost of the steel or tires can be easily traced to or identified with the BMW X6. The workers on the BMW X6 line request materials from the warehouse, and the material requisition document identifies the cost of the materials supplied to the X6. Similarly, individual workers record on their time sheets the hours and minutes they spend working on the X6. The cost of this labor can easily be traced to the X6 and is another example of a direct cost. The term **cost tracing** is used to describe the assignment of direct costs to a particular cost object.
- Indirect costs of a cost object** are related to the particular cost object but cannot be traced to it in an economically feasible (cost-effective) way. For example, the salaries of plant administrators (including the plant manager) who oversee production of the many different types of cars produced at the Spartanburg plant are an indirect cost of the X6s. Plant administration costs are related to the cost object (X6s) because plant administration is necessary for managing the production of these vehicles. Plant administration costs are indirect costs because plant administrators also oversee the production of other products, such as the Z4 Roadster. Unlike steel or tires, there is no specific request made by supervisors of the X6 production line for plant administration services, and it is virtually impossible to trace plant administration costs to the X6 line.

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

Exhibit 2-2

Cost Assignment to a Cost Object



Cost Allocation Challenges

Managers want to assign costs accurately to cost objects because inaccurate product costs will mislead managers about the profitability of different products. This, for example, could result in the managers unknowingly working harder to promote less-profitable products instead of more-profitable products. Generally, managers are more confident about the accuracy of the direct costs of cost objects, such as the cost of steel and tires of the X6.

Consider the cost to lease the Spartanburg plant. This cost is an indirect cost of the X6—there is no separate lease agreement for the area of the plant where the X6 is made. Nonetheless, BMW *allocates* to the X6 a part of the lease cost of the building—for example, on the basis of an estimate of the percentage of the building’s floor space occupied for the production of the X6 relative to the total floor space used to produce all models of cars. This approach measures the building resources used by each car model reasonably and accurately. The more floor space a car model occupies, the greater the lease costs assigned to it. Accurately allocating other indirect costs, such as plant administration, to the X6, however, is more difficult. For example, should these costs be allocated on the basis of the number of employees working on each car model or the number of cars produced of each model? Measuring the share of plant administration used by each car model is not clear-cut.

Factors Affecting Direct/Indirect Cost Classifications

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

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

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

Decision Point

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

Learning Objective 3

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

Cost-Behavior Patterns: Variable Costs and Fixed Costs

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

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

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

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

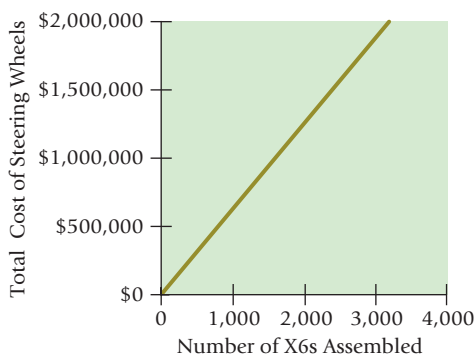
Panel A in Exhibit 2-3 shows a graph of the total variable cost of steering wheels. The cost is represented by a straight line that climbs from left to right. The phrases “strictly variable” and “proportionately variable” are sometimes used to describe the variable cost behavior shown in this panel.

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

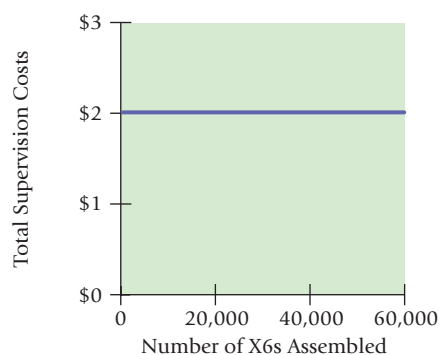
Exhibit 2-3

Graphs of Variable and Fixed Costs

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



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



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

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

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

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

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

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

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

Decision Point

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

A particular cost item could be variable for one level of activity and fixed for another. Consider annual registration and license costs for a fleet of planes owned by an airline company. Registration and license costs would be a variable cost that would change with the number of planes the company owned. But the registration and license costs for a particular plane are fixed regardless of the miles flown by that plane during a year.

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

Cost Drivers

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

Concepts in Action**Zipcar Helps Twitter Reduce Fixed Costs**

In many North American and European cities, Avis subsidiary Zipcar has emerged as a way for corporations to reduce the spending on gas, insurance, and parking of corporate cars. Zipcar—which provides an “on-demand” option for urban individuals and businesses to rent a car by the week, the day, or even the hour—has rates beginning around \$8 per hour and \$75 per day (including gas, insurance, and about 180 miles per day).

Let's think about what Zipcar means for companies. Many small businesses own a company car or two for getting to meetings, making deliveries, and running errands. Similarly, many large companies own a fleet of cars to shuttle visiting executives and clients back and forth from appointments, business lunches,

and the airport. Traditionally, owning these cars has involved very high fixed costs, including buying the asset (car), maintenance costs, and insurance for multiple drivers.

Now, however, companies like Twitter can use Zipcar for on-demand mobility while reducing their transportation and overhead costs. Based in downtown San Francisco, Twitter managers use Zipcar to meet venture capitalists and partners in Silicon Valley and when they travel to places like New York and Boston. “We wanted to avoid the cost of taking taxis everywhere or the time delays of mass transit,” said Jack Dorsey, the micro-blogging service's co-founder. “Zipcar's the fastest, easiest way to get around town.”

From a business perspective, Zipcar allows Twitter and other companies to convert the fixed costs of owning a company car to variable costs. If business slows or a car isn't required to visit a client, Twitter is not saddled with the fixed costs of car ownership. Of course, when business is good, causing Twitter managers to use Zipcar more often, they can end up paying more overall than they would have paid if they purchased and maintained the car themselves.

Along with cutting corporate spending, car sharing services like Zipcar reduce congestion on the road and promote environmental sustainability. Users report reducing their vehicle miles traveled by 44%, and surveys show CO₂ emissions are being cut by up to 50% per user.

Sources: Based on Paul Keegan, “Zipcar—the best new idea in business.” *Fortune* (August 27, 2009); Elizabeth Olsen, “Car sharing reinvents the company wheels.” *New York Times* (May 7, 2009); John Kell, Avis to Buy Car-Sharing Service Zipcar,” *The Wall Street Journal* (January 2, 2013); Zipcar, Inc., “Zipcar for business case studies”; Zipcar, Inc., “Zipcar rates and plans.”

number of parts is a cost driver of product-design costs. Similarly, miles driven is often a cost driver of distribution costs.

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

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

Relevant Range

Relevant range is the band or range of normal activity level or volume in which there is a specific relationship between the level of activity or volume and the cost in question. For example, a fixed cost is fixed only in relation to a given wide range of total activity or volume (at which the company is expected to operate) and only for a given time span (usually a particular budget period). Suppose BMW contracts with Thomas Transport Company (TTC) to transport X6s to BMW dealerships. TTC rents two trucks, and each truck has an annual fixed rental cost of \$40,000. The maximum annual usage of each truck is 120,000 miles. In the current year (2014), the predicted combined total hauling of the two trucks is 170,000 miles.

Exhibit 2-4 shows how annual fixed costs behave at different levels of miles of hauling. Up to 120,000 miles, TTC can operate with one truck; from 120,001 to 240,000 miles, it operates with two trucks; and from 240,001 to 360,000 miles, it operates with three trucks. This pattern will continue as TTC adds trucks to its fleet to provide more miles of hauling. Given the predicted 170,000-mile usage for 2014, the range from 120,001 to 240,000 miles hauled is the range in which TTC expects to operate, resulting in fixed rental costs of \$80,000. Within this relevant range, changes in miles hauled will not affect the annual fixed costs.

Fixed costs may change from one year to the next, though. For example, if the total rental fee of the two trucks increases by \$2,000 for 2015, the total level of fixed costs will increase to \$82,000 (all else remaining the same). If that increase occurs, total rental costs will be fixed at this new level (\$82,000) for 2015 for the miles hauled in the 120,001 to 240,000 range.

The relevant range also applies to variable costs. Outside the relevant range, variable costs, such as direct materials costs, may no longer change proportionately with changes in production volumes. For example, above a certain volume, the cost of direct materials may increase at a lower rate because a firm may be able to negotiate price discounts for purchasing greater amounts of materials from its suppliers.

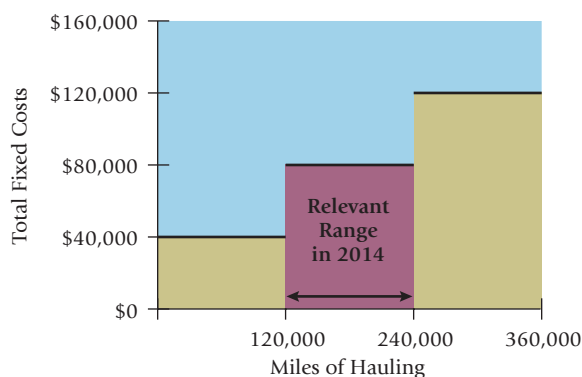


Exhibit 2-4

Fixed-Cost Behavior
at Thomas Transport
Company

Exhibit 2-5

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

		Assignment of Costs to Cost Object	
		Direct Costs	Indirect Costs
Cost-Behavior Pattern	Variable Costs	<ul style="list-style-type: none"> • Cost object: BMW X6s produced Example: Tires used in assembly of automobile 	<ul style="list-style-type: none"> • Cost object: BMW X6s produced Example: Power costs at Spartanburg plant. Power usage is metered only to the plant, where multiple products are assembled.
	Fixed Costs	<ul style="list-style-type: none"> • Cost object: BMW X6s produced Example: Salary of supervisor on BMW X6 assembly line 	<ul style="list-style-type: none"> • Cost object: BMW X6s produced Example: Annual lease costs at Spartanburg plant. Lease is for whole plant, where multiple products are produced.

Relationships Between Types of Costs

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

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

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

Learning Objective 4

Interpret unit costs cautiously

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

Total Costs and Unit Costs

The preceding section concentrated on the behavior patterns of total costs in relation to activity or volume levels. We now consider unit costs.

Unit Costs

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

Before reaching a decision, the booking agent also must predict the number of people who will attend. Without knowing the number of attendees, she cannot make an informed decision about the admission price she needs to charge to recover the cost of the event or even on whether to have the event at all. So she computes the unit cost of the event by dividing the total cost (\$4,000,000) by the expected number of people who will attend. If 50,000 people attend, the unit cost is \$80 ($\$4,000,000 \div 50,000$) per person; if 20,000 attend, the unit cost increases to \$200 ($\$4,000,000 \div 20,000$). Unless the total cost is “unitized” (that is, averaged by the level of activity or volume), the \$4,000,000 cost is difficult to interpret. The unit cost combines the total cost and the number of people in a simple and understandable way.

Accounting systems typically report both total-cost amounts and average-cost-per-unit amounts. The units might be expressed in various ways. Examples are automobiles assembled, packages delivered, or hours worked. Consider Tennessee Products, a manufacturer of speaker systems with a plant in Memphis. Suppose that, in 2014, its first year of operations, the company incurs \$40,000,000 of manufacturing costs to produce 500,000 speaker systems. Then the unit cost is \$80:

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

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

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

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

Use Unit Costs Cautiously

Although unit costs are regularly used in financial reports and for making product mix and pricing decisions, *managers should think in terms of total costs rather than unit costs for many decisions.* Consider the manager of the Memphis plant of Tennessee Products. Assume the \$40,000,000 in costs in 2014 consist of \$10,000,000 of fixed costs and \$30,000,000 of variable costs (at \$60 variable cost per speaker system produced). Suppose the total fixed costs and the variable cost per speaker system in 2015 are expected to be unchanged from 2014. The budgeted costs for 2015 at different production levels, calculated on the basis of total variable costs, total fixed costs, and total costs, are:

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

A plant manager who uses the 2014 unit cost of \$80 per unit will underestimate actual total costs if the plant’s 2015 output is below the 2014 level of 500,000 units. If the volume produced falls to 200,000 units due to, say, the presence of a new competitor and less demand, actual costs would be \$22,000,000. The unit cost of \$80 times 200,000 units equals \$16,000,000, which underestimates the actual total costs by \$6,000,000 (\$22,000,000 – \$16,000,000). In other words, *the unit cost of \$80 applies only when the company produces 500,000 units.*

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

Decision Point
 How should managers estimate and interpret cost information?

Learning Objective 5

Distinguish inventoriable costs

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

from period costs

... expenses of the period when incurred

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

In this section, we describe the different sectors of the economy, the different types of inventory that companies hold, and some commonly used classifications of manufacturing costs.

Manufacturing-, Merchandising-, and Service-Sector Companies

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

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

Types of Inventory

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

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

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

Commonly Used Classifications of Manufacturing Costs

Three terms commonly used when describing manufacturing costs are *direct materials costs*, *direct manufacturing labor costs*, and *indirect manufacturing costs*. These terms

build on the direct versus indirect cost distinction we described earlier in the context of manufacturing costs.

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

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

Inventoriable Costs

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

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

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

Period Costs

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

Exhibit 2-6

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

		Assignment of Costs to Cost Object	
		Direct Costs	Indirect Costs
Cost-Behavior Pattern	Variable Costs	<ul style="list-style-type: none"> • Cost object: Number of mortgage loans Example: Fees paid to property appraisal company for each mortgage loan 	<ul style="list-style-type: none"> • Cost object: Number of mortgage loans Example: Postage paid to deliver mortgage-loan documents to lawyers/homeowners
	Fixed Costs	<ul style="list-style-type: none"> • Cost object: Number of mortgage loans Example: Salary paid to executives in mortgage loan department to develop new mortgage-loan products 	<ul style="list-style-type: none"> • Cost object: Number of mortgage loans Example: Cost to the bank of sponsoring annual golf tournament

to increase revenues in only that period and not in future periods. Some costs such as R&D costs are treated as period costs because, although these costs may increase revenues in a future period if the R&D efforts are successful, it is highly uncertain if and when these increased revenues will occur. Expensing period costs as they are incurred best matches expenses to revenues.

For manufacturing-sector companies, all nonmanufacturing costs (for example, design costs and costs of shipping products to customers) in the income statement are period costs. For merchandising-sector companies, all costs in the income statement not related to the cost of goods purchased for resale are period costs. Examples of these period costs are labor costs of sales-floor personnel and advertising costs. Because there are no inventoriable costs for service-sector companies, all costs in the income statement are period costs.

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

Decision Point

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

Learning Objective 6

Illustrate the flow of inventoriable and period costs

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

Illustrating the Flow of Inventoriable Costs and Period Costs

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

Manufacturing-Sector Example

Follow the flow of costs for Cellular Products in Exhibits 2-7 and 2-8. Exhibit 2-7 visually highlights the differences in the flow of inventoriable and period costs for a manufacturing-sector company. Note how, as described in the previous section, inventoriable costs go through the balance sheet accounts of work-in-process inventory and finished goods inventory before entering the cost of goods sold in the income statement. Period costs are expensed directly in the income statement. Exhibit 2-8 takes the visual presentation in Exhibit 2-7 and shows how inventoriable costs and period expenses would appear in the income statement and schedule of cost of goods manufactured of a manufacturing company.

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

Step 1: Cost of direct materials used in 2014. Note how the arrows in Exhibit 2-7 for beginning inventory, \$11,000, and direct material purchases, \$73,000, “fill up” the direct materials inventory box and how direct materials used, \$76,000, “empties out” direct material inventory, leaving an ending inventory of direct materials of \$8,000 that becomes the beginning inventory for the next year.

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

Beginning inventory of direct materials, January 1, 2014	\$11,000
+ Purchases of direct materials in 2014	73,000
– Ending inventory of direct materials, December 31, 2014	<u>8,000</u>
= Direct materials used in 2014	<u>\$76,000</u>

Step 2: Total manufacturing costs incurred in 2014. Total manufacturing costs refers to all direct manufacturing costs and manufacturing overhead costs incurred during 2014 for all goods worked on during the year. Cellular Products classifies its manufacturing costs into the three categories described earlier.

(i) Direct materials used in 2014 (shaded light blue in Exhibit 2-8, Panel B)	\$ 76,000
(ii) Direct manufacturing labor in 2014 (shaded blue in Exhibit 2-8, Panel B)	9,000
(iii) Manufacturing overhead costs in 2014 (shaded dark blue in Exhibit 2-8, Panel B)	<u>20,000</u>
Total manufacturing costs incurred in 2014	<u>\$105,000</u>

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

Exhibit 2-7 Flow of Revenue and Costs for a Manufacturing-Sector Company, Cellular Products (in thousands)

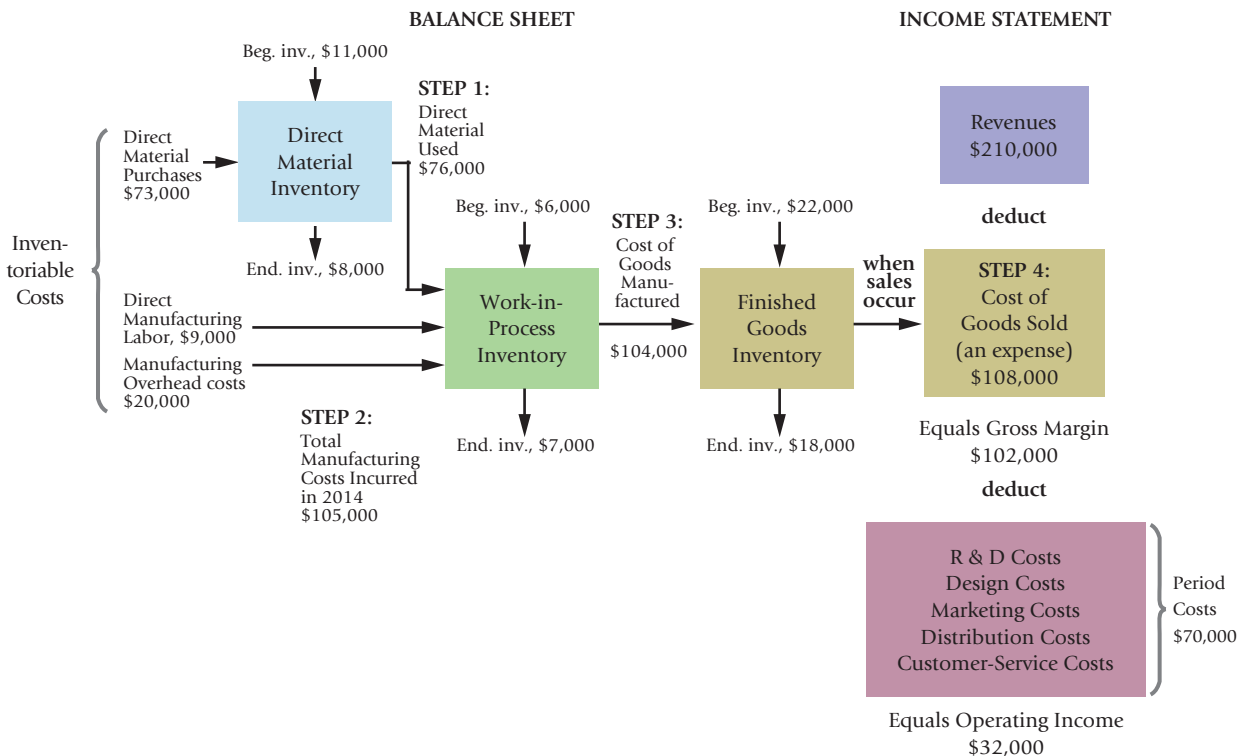
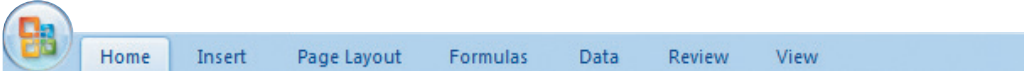


Exhibit 2-8 Income Statement and Schedule of Cost of Goods Manufactured of a Manufacturing-Sector Company, Cellular Products

				
	A	B	C	D
1	PANEL A: INCOME STATEMENT			
2	Cellular Products			
3	Income Statement			
4	For the Year Ended December 31, 2014 (in thousands)			
5	Revenues		\$210,000	
6	Cost of goods sold:			
7	Beginning finished goods inventory, January 1, 2014	\$ 22,000		
8	Cost of goods manufactured (see Panel B)	<u>104,000</u>		
9	Cost of goods available for sale	126,000		
10	Ending finished goods inventory, December 31, 2014	<u>18,000</u>		
11	Cost of goods sold		<u>108,000</u>	
12	Gross margin (or gross profit)		102,000	
13	Operating costs:			
14	R&D, design, mktg., dist., and cust.-service cost	70,000		
15	Total operating costs		<u>70,000</u>	
16	Operating income		<u>\$ 32,000</u>	
17				
18	PANEL B: COST OF GOODS MANUFACTURED			
19	Cellular Products			
20	Schedule of Cost of Goods Manufactured^a			
21	For the Year Ended December 31, 2014 (in thousands)			
22	Direct materials:			
23	Beginning inventory, January 1, 2014	\$11,000		
24	Purchases of direct materials	<u>73,000</u>		
25	Cost of direct materials available for use	84,000		
26	Ending inventory, December 31, 2014	<u>8,000</u>		
27	Direct materials used		\$ 76,000	
28	Direct manufacturing labor		9,000	
29	Manufacturing overhead costs:			
30	Indirect manufacturing labor	\$ 7,000		
31	Supplies	2,000		
32	Heat, light, and power	5,000		
33	Depreciation—plant building	2,000		
34	Depreciation—plant equipment	3,000		
35	Miscellaneous	<u>1,000</u>		
36	Total manufacturing overhead costs		<u>20,000</u>	
37	Manufacturing costs incurred during 2014		105,000	
38	Beginning work-in-process inventory, January 1, 2014		<u>6,000</u>	
39	Total manufacturing costs to account for		111,000	
40	Ending work-in-process inventory, December 31, 2014		<u>7,000</u>	
41	Cost of goods manufactured (to income statement)		<u>\$104,000</u>	
42	^a Note that this schedule can become a schedule of cost of goods manufactured and sold simply by including the beginning and ending finished goods inventory figures in the supporting schedule rather than in the body of the income statement.			

STEP 4

STEP 1

STEP 2

STEP 3

Step 3: Cost of goods manufactured in 2014. Cost of goods manufactured refers to the cost of goods brought to completion, whether they were started before or during the current accounting period.

Note how the work-in-process inventory box in Exhibit 2-7 has a very similar structure to the direct materials inventory box described in Step 1. Beginning work-in-process inventory of \$6,000 and total manufacturing costs incurred in 2014 of \$105,000 “fill up” the work-in-process inventory box. Some of the manufacturing costs incurred during 2014 are held back as the cost of the ending work-in-process inventory. The ending work-in-process inventory of \$7,000 becomes the beginning inventory for the next year, and the \$104,000 cost of goods manufactured during 2014 “empties out” the work-in-process inventory while “filling up” the finished goods inventory box.

The cost of goods manufactured in 2014 (shaded green) is calculated in Exhibit 2-8, Panel B, as follows:

Beginning work-in-process inventory, January 1, 2014	\$ 6,000
+ Total manufacturing costs incurred in 2014	<u>105,000</u>
= Total manufacturing costs to account for	111,000
– Ending work-in-process inventory, December 31, 2014	<u>7,000</u>
= Cost of goods manufactured in 2014	<u>\$104,000</u>

Step 4: Cost of goods sold in 2014. The cost of goods sold is the cost of finished goods inventory sold to customers during the current accounting period. Looking at the finished goods inventory box in Exhibit 2-7, we see that the beginning inventory of finished goods of \$22,000 and cost of goods manufactured in 2014 of \$104,000 “fill up” the finished goods inventory box. The ending inventory of finished goods of \$18,000 becomes the beginning inventory for the next year, and the \$108,000 cost of goods sold during 2014 “empties out” the finished goods inventory.

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

Beginning inventory of finished goods, January 1, 2014	\$ 22,000
+ Cost of goods manufactured in 2014	104,000
– Ending inventory of finished goods, December 31, 2014	<u>18,000</u>
= Cost of goods sold in 2014	<u>\$108,000</u>

Exhibit 2-9 shows related general ledger T-accounts for Cellular Products’ manufacturing cost flow. Note how the cost of goods manufactured (\$104,000) is the cost of all goods completed during the accounting period. These costs are all inventoriable costs. Goods completed during the period are transferred to finished goods inventory. These costs become cost of goods sold in the accounting period when the goods are sold. Also note that the direct materials, direct manufacturing labor, and manufacturing overhead costs of the units in work-in-process inventory (\$7,000) and finished goods inventory (\$18,000) as of December 31, 2014, will appear as an asset in the balance sheet. These costs will become expenses next year when the work-in-process inventory is converted to finished goods and the finished goods are sold.

Exhibit 2-9

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

Work-in-Process Inventory		Finished Goods Inventory		Cost of Goods Sold
Bal. Jan. 1, 2014	6,000	Bal. Jan. 1, 2014	22,000	
Direct materials used	76,000	Cost of goods manufactured	104,000	108,000
Direct manuf. labor	9,000	Bal. Dec. 31, 2014	18,000	
Indirect manuf. costs	20,000			
Bal. Dec. 31, 2014	7,000			

We can now prepare Cellular Products' income statement for 2014. The income statement of Cellular Products is shown on the right side in Exhibit 2-7 and in Exhibit 2-8, Panel A. Revenues of Cellular Products are (in thousands) \$210,000. Inventoriable costs expensed during 2014 equal cost of goods sold of \$108,000.

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

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

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

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

Recap of Inventoriable Costs and Period Costs

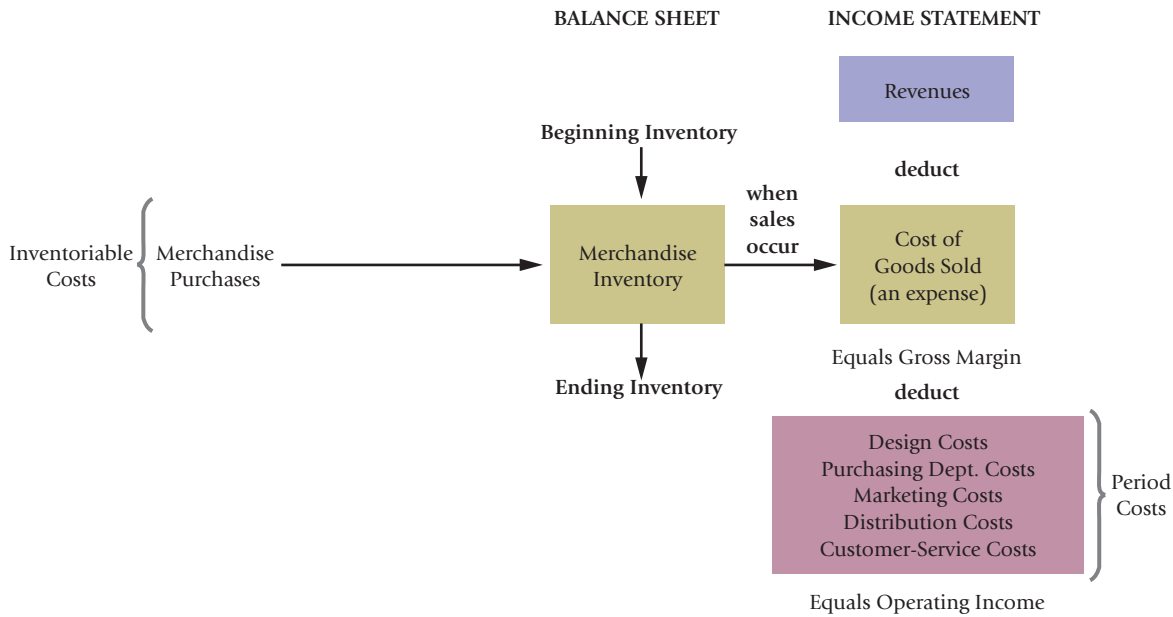
Exhibit 2-7 highlights the differences between inventoriable costs and period costs for a manufacturing company. The manufacturing costs of finished goods include direct materials, direct manufacturing labor, and manufacturing overhead costs such as supervision, production control, and machine maintenance. All these costs are inventoriable: They are assigned to work-in-process inventory until the goods are completed and then to finished goods inventory until the goods are sold. All nonmanufacturing costs, such as R&D, design, and distribution costs, are period costs.

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

Decision Point

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

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



Prime Costs and Conversion Costs

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

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

Concepts in Action ▶ Cost Structure at Nordstrom Spurs Growth



During the recent global recession, the retail industry was hit hard due to declining economic conditions and changing consumer shopping habits. Since 2009, many long-standing retailers including Circuit City, Blockbuster, and Borders went out of business as their revenues failed to keep pace with the high fixed costs of the retail business, which include high rents and payroll. While some retailers closed their doors, however, other retailers became stronger and were prepared to grow as consumer spending recovered.

While many failed retailers had high fixed costs, Nordstrom, an upscale department store chain, has a more variable cost structure. At Nordstrom, the company’s operations are mainly based on a variable cost business model with about 40–45% of its selling, general, and administrative (SGA) costs being variable. These costs include compensation (most salespeople earn a commission), benefits, advertising, and shipping and handling. As consumer spending dropped during the recession, the company reduced costs to mitigate the impact of sluggish sales trends on margins. Similarly, its cost structure enabled Nordstrom to quickly capitalize on the emerging opportunities when market conditions improved.

For example, in 2009 Nordstrom’s SGA expenses were 25.5% of its \$8.2 billion in revenue. In 2011, its SGA expenses increased to 26.7%, but revenues were \$10.5 billion. The company’s variable cost flexibility allowed the company to first cut costs and then to aggressively pursue growth while incurring slightly higher SGA costs.

Sources: Based on Nordstrom, Inc., 2012. 2011 Annual Report. Seattle, WA: Nordstrom, Inc.; Zacks Equity Research, “Nordstrom Pinned to Neutral,” May 22, 2012.

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

$$\text{Conversion costs} = \begin{array}{c} \text{Direct manufacturing} \\ \text{labor costs} \end{array} + \begin{array}{c} \text{Manufacturing} \\ \text{overhead costs} \end{array} = \$9,000 + \$20,000 = \$29,000$$

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

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

Learning Objective 7

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

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

Measuring Costs Requires Judgment

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

Measuring Labor Costs

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

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

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

Overtime Premium and Idle Time

Managers need to pay special attention to two classes of indirect labor—overtime premium and idle time. **Overtime premium** is the wage rate paid to workers (for both direct labor and indirect labor) in *excess* of their straight-time wage rates. Overtime premium is usually considered to be a part of indirect costs or overhead. Consider the example of George Flexner, a junior software programmer who writes software for multiple products. He is paid \$40 per hour for straight-time and \$60 per hour (time and a half) for overtime. His overtime premium is \$20 per overtime hour. If he works 44 hours, including 4 overtime hours, in one week, his gross compensation would be classified as follows:

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

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

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

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

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

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

Benefits of Defining Accounting Terms

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

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

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

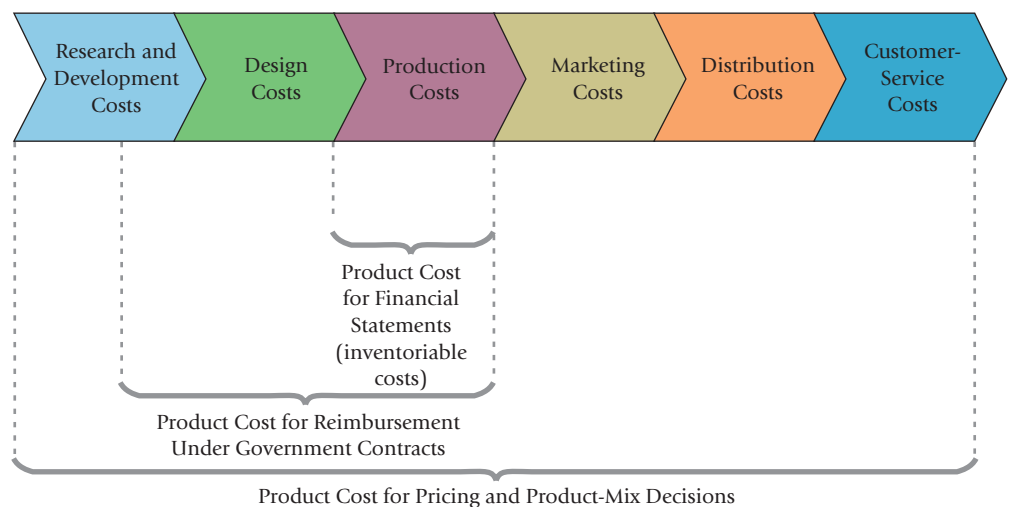
Different Meanings of Product Costs

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

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

Exhibit 2-11

Different Product Costs for Different Purposes



- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Business function <ol style="list-style-type: none"> a. Research and development b. Design of products and processes c. Production d. Marketing e. Distribution f. Customer service 2. Assignment to a cost object <ol style="list-style-type: none"> a. Direct cost b. Indirect cost | <ol style="list-style-type: none"> 3. Behavior pattern in relation to the level of activity or volume <ol style="list-style-type: none"> a. Variable cost b. Fixed cost 4. Aggregate or average <ol style="list-style-type: none"> a. Total cost b. Unit cost 5. Assets or expenses <ol style="list-style-type: none"> a. Inventoriable cost b. Period cost |
|---|---|

Exhibit 2-12Alternative
Classifications of Costs

product-cost calculations for a specific contract may allow for all design and production costs but only part of R&D costs.

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

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

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

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

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

A Framework for Cost Accounting and Cost Management

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

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

Decision Point

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

Learning Objective 8

Describe a framework for cost accounting and cost management

... three features that help managers make decisions

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

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

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

Obtaining Information for Planning and Control and Performance Evaluation

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

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

Analyzing the Relevant Information for Making Decisions

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

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

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

Decision Point

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

Problem for Self-Study

Foxwood Company is a metal- and woodcutting manufacturer, selling products to the home-construction market. Consider the following data for 2014:

Sandpaper	\$ 2,000
Materials-handling costs	70,000
Lubricants and coolants	5,000
Miscellaneous indirect manufacturing labor	40,000
Direct manufacturing labor	300,000
Direct materials inventory, Jan. 1, 2014	40,000
Direct materials inventory, Dec. 31, 2014	50,000
Finished goods inventory, Jan. 1, 2014	100,000
Finished goods inventory, Dec. 31, 2014	150,000
Work-in-process inventory, Jan. 1, 2014	10,000
Work-in-process inventory, Dec. 31, 2014	14,000
Plant-leasing costs	54,000
Depreciation—plant equipment	36,000
Property taxes on plant equipment	4,000
Fire insurance on plant equipment	3,000
Direct materials purchased	460,000
Revenues	1,360,000
Marketing promotions	60,000
Marketing salaries	100,000
Distribution costs	70,000
Customer-service costs	100,000

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

Required

Solution

1.

Foxwood Company			
Income Statement			
For the Year Ended December 31, 2014			
Revenues			\$1,360,000
Cost of goods sold			
Beginning finished goods inventory, January 1, 2014	\$ 100,000		
Cost of goods manufactured (see the following schedule)	<u>960,000</u>		
Cost of goods available for sale		1,060,000	
Deduct ending finished goods inventory, December 31, 2014		<u>150,000</u>	<u>910,000</u>
Gross margin (or gross profit)			450,000
Operating costs			
Marketing promotions	60,000		
Marketing salaries	100,000		
Distribution costs	70,000		
Customer-service costs	<u>100,000</u>		<u>330,000</u>
Operating income			<u><u>\$ 120,000</u></u>

Foxwood Company			
Schedule of Cost of Goods Manufactured			
For the Year Ended December 31, 2014			
Direct materials			
Beginning inventory, January 1, 2014			\$ 40,000
Purchases of direct materials			<u>460,000</u>
Cost of direct materials available for use			500,000
Ending inventory, December 31, 2014			<u>50,000</u>
Direct materials used			450,000 (V)
Direct manufacturing labor			300,000 (V)
Indirect manufacturing costs			
Sandpaper	\$ 2,000 (V)		
Materials-handling costs	70,000 (V)		
Lubricants and coolants	5,000 (V)		
Miscellaneous indirect manufacturing labor	40,000 (V)		
Plant-leasing costs	54,000 (F)		
Depreciation—plant equipment	36,000 (F)		
Property taxes on plant equipment	4,000 (F)		
Fire insurance on plant equipment	<u>3,000 (F)</u>		<u>214,000</u>
Manufacturing costs incurred during 2014			964,000
Beginning work-in-process inventory, January 1, 2014			<u>10,000</u>
Total manufacturing costs to account for			974,000
Ending work-in-process inventory, December 31, 2014			<u>14,000</u>
Cost of goods manufactured (to income statement)			<u><u>\$ 960,000</u></u>

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

► Decision Points

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

Decision

Guidelines

- | | |
|--|--|
| 1. What is a cost object? | A cost object is anything for which a manager needs a separate measurement of cost. Examples include a product, a service, a project, a customer, a brand category, an activity, and a department. |
| 2. How do managers decide whether a cost is a direct or an indirect cost? | A direct cost is any cost that is related to a particular cost object and can be traced to that cost object in an economically feasible way. Indirect costs are related to a particular cost object but cannot be traced to it in an economically feasible way. The same cost can be direct for one cost object and indirect for another cost object. This book uses <i>cost tracing</i> to describe the assignment of direct costs to a cost object and <i>cost allocation</i> to describe the assignment of indirect costs to a cost object. |
| 3. How do managers decide whether a cost is a variable or a fixed cost? | A variable cost changes <i>in total</i> in proportion to changes in the related level of total activity or volume of output produced. A fixed cost remains unchanged <i>in total</i> for a given time period despite wide changes in the related level of total activity or volume of output produced. |
| 4. How should managers estimate and interpret cost information? | In general, focus on total costs, not unit costs. When making total cost estimates, think of variable costs as an amount per unit and fixed costs as a total amount. Interpret the unit cost of a cost object cautiously when it includes a fixed-cost component. |
| 5. What are the differences in the accounting for inventoriable versus period costs? | Inventoriable costs are all costs of a product that a company regards as an asset in the accounting period in which they are incurred and which become cost of goods sold in the accounting period in which the product is sold. Period costs are expensed in the accounting period in which they are incurred and are all of the costs in an income statement other than cost of goods sold. |

Decision

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

Guidelines

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

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

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

Terms to Learn

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

actual cost (p. 29)	direct manufacturing labor costs (p. 39)	operating income (p. 44)
average cost (p. 36)	direct material costs (p. 39)	overtime premium (p. 47)
budgeted cost (p. 29)	direct materials inventory (p. 38)	period costs (p. 39)
conversion costs (p. 46)	factory overhead costs (p. 39)	prime costs (p. 45)
cost (p. 29)	finished goods inventory (p. 38)	product cost (p. 48)
cost accumulation (p. 29)	fixed cost (p. 32)	relevant range (p. 35)
cost allocation (p. 30)	idle time (p. 47)	revenues (p. 39)
cost assignment (p. 30)	indirect costs of a cost object (p. 30)	service-sector companies (p. 38)
cost driver (p. 34)	indirect manufacturing costs (p. 39)	unit cost (p. 36)
cost object (p. 29)	inventoriable costs (p. 39)	variable cost (p. 32)
cost of goods manufactured (p. 43)	manufacturing overhead costs (p. 39)	work-in-process inventory (p. 38)
cost tracing (p. 30)	manufacturing-sector companies (p. 38)	work in progress (p. 38)
direct costs of a cost object (p. 30)	merchandising-sector companies (p. 38)	

Assignment Material**MyAccountingLab****Questions**

- 2-1** Define cost object and give three examples.
- 2-2** Define direct costs and indirect costs.
- 2-3** Why do managers consider direct costs to be more accurate than indirect costs?
- 2-4** Name three factors that will affect the classification of a cost as direct or indirect.
- 2-5** Define variable cost and fixed cost. Give an example of each.
- 2-6** What is a cost driver? Give one example.
- 2-7** What is the relevant range? What role does the relevant-range concept play in explaining how costs behave?
- 2-8** Explain why unit costs must often be interpreted with caution.
- 2-9** Describe how manufacturing-, merchandising-, and service-sector companies differ from one another.
- 2-10** What are three different types of inventory that manufacturing companies hold?
- 2-11** Distinguish between inventoriable costs and period costs.

- 2-12** Define the following: direct material costs, direct manufacturing-labor costs, manufacturing overhead costs, prime costs, and conversion costs.
- 2-13** Describe the overtime-premium and idle-time categories of indirect labor.
- 2-14** Define product cost. Describe three different purposes for computing product costs.
- 2-15** What are three common features of cost accounting and cost management?

Exercises

MyAccountingLab

2-16 Computing and interpreting manufacturing unit costs. Minnesota Office Products (MOP) produces three different paper products at its Vaasa lumber plant: Supreme, Deluxe, and Regular. Each product has its own dedicated production line at the plant. It currently uses the following three-part classification for its manufacturing costs: direct materials, direct manufacturing labor, and manufacturing overhead costs. Total manufacturing overhead costs of the plant in July 2014 are \$150 million (\$15 million of which are fixed). This total amount is allocated to each product line on the basis of the direct manufacturing labor costs of each line. Summary data (in millions) for July 2014 are as follows:

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

Required

1. Compute the manufacturing cost per unit for each product produced in July 2014.
2. Suppose that, in August 2014, production was 150 million units of Supreme, 190 million units of Deluxe, and 220 million units of Regular. Why might the July 2014 information on manufacturing cost per unit be misleading when predicting total manufacturing costs in August 2014?

2-17 Direct, indirect, fixed, and variable costs. Wonder Bakery manufactures two types of bread, which it sells as wholesale products to various specialty retail bakeries. Each loaf of bread requires a three-step process. The first step is mixing. The mixing department combines all of the necessary ingredients to create the dough and processes it through high-speed mixers. The dough is then left to rise before baking. The second step is baking, which is an entirely automated process. The baking department molds the dough into its final shape and bakes each loaf of bread in a high-temperature oven. The final step is finishing, which is an entirely manual process. The finishing department coats each loaf of bread with a special glaze, allows the bread to cool, and then carefully packages each loaf in a specialty carton for sale in retail bakeries.

Required

1. Costs involved in the process are listed next. For each cost, indicate whether it is a direct variable, direct fixed, indirect variable, or indirect fixed cost, assuming “units of production of each kind of bread” is the cost object.

Costs:

Yeast	Mixing department manager
Flour	Materials handlers in each department
Packaging materials	Custodian in factory
Depreciation on ovens	Night guard in factory
Depreciation on mixing machines	Machinist (running the mixing machine)
Rent on factory building	Machine maintenance personnel in each department
Fire insurance on factory building	Maintenance supplies for factory
Factory utilities	Cleaning supplies for factory
Finishing department hourly laborers	

2. If the cost object were the “mixing department” rather than units of production of each kind of bread, which preceding costs would now be direct instead of indirect costs?

2-18 Classification of costs, service sector. Market Focus is a marketing research firm that organizes focus groups for consumer-product companies. Each focus group has eight individuals who are paid \$60 per session to provide comments on new products. These focus groups meet in hotels and are led by a trained, independent marketing specialist hired by Market Focus. Each specialist is paid a fixed retainer to conduct a minimum number of sessions and a per session fee of \$2,200. A Market Focus staff member attends each session to ensure that all the logistical aspects run smoothly.

Required

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

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

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

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

2-19 Classification of costs, merchandising sector. Band Box Entertainment (BBE) operates a large store in Atlanta, Georgia. The store has both a movie (DVD) section and a music (CD) section. BBE reports revenues for the movie section separately from the music section.

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

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

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

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

2-20 Classification of costs, manufacturing sector. The Kitakyushu, Japan, plant of Nissan Motor Corporation assembles two types of cars (Teanas and Muranos). Separate assembly lines are used for each type of car.

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

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

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

Cost Item	D or I V or F
A. Cost of tires used on Teanas	
B. Salary of public relations manager for Kitakyushu plant	
C. Annual awards dinner for Teana suppliers	
D. Cost of lubricant used on the Teana assembly line	

Required

Required

- E. Freight costs of Teana engines shipped from Yokohama to Kitakyushu
- F. Electricity costs for Teana assembly line (single bill covers entire plant)
- G. Wages paid to temporary assembly-line workers hired in periods of high Teana production (paid on hourly basis)
- H. Annual fire-insurance policy cost for Kitakyushu plant

2-21 Variable costs, fixed costs, total costs. Bridget Ashton is getting ready to open a small restaurant. She is on a tight budget and must choose between the following long-distance phone plans:

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

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

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

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

Required

2-22 Variable and Fixed Costs. Beacher Motors specializes in producing one specialty vehicle. It is called Surfer and is styled to easily fit multiple surfboards in its back area and top-mounted storage racks. Beacher has the following manufacturing costs:

Plant management costs, \$1,200,000 per year

Cost of leasing equipment, \$1,800,000 per year

Workers' wages, \$700 per Surfer vehicle produced

Direct materials costs: Steel, \$1,500 per Surfer; Tires, \$125 per tire, each Surfer takes 5 tires (one spare).

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

0–500 tires	\$ 50,000
501–1,000 tires	\$ 74,500
more than 1,000 tires	\$200,000

Beacher currently produces 110 vehicles per month.

1. What is the variable manufacturing cost per vehicle? What is the fixed manufacturing cost per month?
2. Plot a graph for the variable manufacturing costs and a second for the fixed manufacturing costs per month. How does the concept of relevant range relate to your graphs? Explain.
3. What is the total manufacturing cost of each vehicle if 100 vehicles are produced each month? 225 vehicles? How do you explain the difference in the manufacturing cost per unit?

Required

2-23 Variable costs, fixed costs, relevant range. Dotball Candies manufactures jaw-breaker candies in a fully automated process. The machine that produces candies was purchased recently and can make 4,400 per month. The machine costs \$9,500 and is depreciated using straight-line depreciation over 10 years assuming zero residual value. Rent for the factory space and warehouse and other fixed manufacturing overhead costs total \$1,300 per month.

Dotball currently makes and sells 3,100 jaw-breakers per month. Dotball buys just enough materials each month to make the jaw-breakers it needs to sell. Materials cost 10 cents per jawbreaker.

Next year Dotball expects demand to increase by 100%. At this volume of materials purchased, it will get a 10% discount on price. Rent and other fixed manufacturing overhead costs will remain the same.

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

Required

2-24 Cost drivers and value chain. Roxbury Mobile Company (RMC) is developing a new touch-screen smartphone to compete in the cellular phone industry. The company will sell the phones at wholesale prices to cell phone companies, which will in turn sell them in retail stores to the final customer. RMC has undertaken the following activities in its value chain to bring its product to market:

- Identify customer needs (What do smartphone users want?)
- Perform market research on competing brands

Design a prototype of the RMC smartphone
 Market the new design to cell phone companies
 Manufacture the RMC smartphone
 Process orders from cell phone companies
 Package the RMC smartphones
 Deliver the RMC smartphones to the cell phone companies
 Provide online assistance to cell phone users for use of the RMC smartphone
 Make design changes to the smartphone based on customer feedback

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

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

Required

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

2-25 Cost drivers and functions. The representative cost drivers in the right column of this table are randomized so they do not match the list of functions in the left column.

Function	Representative Cost Driver
1. Accounts payable	A. Number of invoices sent
2. Recruiting	B. Number of purchase orders
3. Data processing	C. Number of research scientists
4. Research and development	D. Hours of computer processing unit (CPU)
5. Purchasing	E. Number of employees hired
6. Warehousing	F. Number of payments processed
7. Billing	G. Number of pallets moved

Required

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

2-26 Total costs and unit costs, service setting. The Big Event (TBE) recently started a business organizing food and music at weddings and other large events. In order to better understand the profitability of the business, the owner has asked you for an analysis of costs—what costs are fixed, what costs are variable, and so on, for each event. You have the following cost information:

Music costs: \$10,000 per event
 Catering costs:
 Food: \$65 per guest
 Setup/cleanup: \$15 per guest
 Fixed fee: \$4,000 per event

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

Required

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

2-27 Total and unit cost, decision making. Gayle's Glassworks makes glass flanges for scientific use. Materials cost \$1 per flange, and the glass blowers are paid a wage rate of \$28 per hour. A glass blower blows 10 flanges per hour. Fixed manufacturing costs for flanges are \$28,000 per period. Period (nonmanufacturing) costs associated with flanges are \$10,000 per period and are fixed.

Required

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

2-28 Inventoriable costs versus period costs. Each of the following cost items pertains to one of these companies: Star Market (a merchandising-sector company), Maytag (a manufacturing-sector company), and Yahoo! (a service-sector company):

- a. Cost of lettuce and tomatoes on sale in Star Market's produce department
 - b. Electricity used to provide lighting for assembly-line workers at a Maytag refrigerator-assembly plant
 - c. Depreciation on Yahoo!'s computer equipment used to update its Web site
 - d. Electricity used to provide lighting for Star Market's store aisles
 - e. Depreciation on Maytag's computer equipment used for quality testing of refrigerator components during the assembly process
 - f. Salaries of Star Market's marketing personnel planning local-newspaper advertising campaigns
 - g. Perrier mineral water purchased by Yahoo! for consumption by its software engineers
 - h. Salaries of Yahoo!'s marketing personnel selling advertising
 - i. Depreciation on vehicles used to transport Maytag refrigerators to retail stores
1. Distinguish between manufacturing-, merchandising-, and service-sector companies.
 2. Distinguish between inventoriable costs and period costs.
 3. Classify each of the cost items (a–h) as an inventoriable cost or a period cost. Explain your answers.

Required

Problems

MyAccountingLab

2-29 Computing cost of goods purchased and cost of goods sold. The following data are for Marvin Department Store. The account balances (in thousands) are for 2014.

Marketing, distribution, and customer-service costs	\$ 37,000
Merchandise inventory, January 1, 2014	27,000
Utilities	17,000
General and administrative costs	43,000
Merchandise inventory, December 31, 2014	34,000
Purchases	155,000
Miscellaneous costs	4,000
Transportation-in	7,000
Purchase returns and allowances	4,000
Purchase discounts	6,000
Revenues	280,000

Required

1. Compute (a) the cost of goods purchased and (b) the cost of goods sold.
2. Prepare the income statement for 2014.

2-30 Cost of goods purchased, cost of goods sold, and income statement. The following data are for Montgomery Retail Outlet Stores. The account balances (in thousands) are for 2014.

Marketing and advertising costs	\$ 48,000
Merchandise inventory, January 1, 2014	90,000
Shipping of merchandise to customers	4,000
Building depreciation	8,400
Purchases	520,000
General and administrative costs	64,000
Merchandise inventory, December 31, 2014	104,000
Merchandise freight-in	20,000
Purchase returns and allowances	22,000
Purchase discounts	18,000
Revenues	640,000

Required

1. Compute (a) the cost of goods purchased and (b) the cost of goods sold.
2. Prepare the income statement for 2014.

2-31 Flow of Inventoriable Costs. Renka's Heaters selected data for October 2014 are presented here (in millions):

Direct materials inventory 10/1/2014	\$ 105
Direct materials purchased	365
Direct materials used	385
Total manufacturing overhead costs	450
Variable manufacturing overhead costs	265
Total manufacturing costs incurred during October 2014	1,610
Work-in-process inventory 10/1/2014	230
Cost of goods manufactured	1,660
Finished goods inventory 10/1/2014	130
Cost of goods sold	1,770

Required

Calculate the following costs:

1. Direct materials inventory 10/31/2014
2. Fixed manufacturing overhead costs for October 2014
3. Direct manufacturing labor costs for October 2014
4. Work-in-process inventory 10/31/2014
5. Cost of finished goods available for sale in October 2014
6. Finished goods inventory 10/31/2014

2-32 Cost of goods manufactured, income statement, manufacturing company. Consider the following account balances (in thousands) for the Peterson Company:

Peterson Company	Beginning of 2014	End of 2014
Direct materials inventory	21,000	23,000
Work-in-process inventory	26,000	25,000
Finished goods inventory	13,000	20,000
Purchases of direct materials		74,000
Direct manufacturing labor		22,000
Indirect manufacturing labor		17,000
Plant insurance		7,000
Depreciation—plant, building, and equipment		11,000
Repairs and maintenance—plant		3,000
Marketing, distribution, and customer-service costs		91,000
General and administrative costs		24,000

1. Prepare a schedule for the cost of goods manufactured for 2014.
2. Revenues for 2014 were \$310 million. Prepare the income statement for 2014.

Required

2-33 Cost of goods manufactured, income statement, manufacturing company. Consider the following account balances (in thousands) for the Shaler Corporation:

Shaler Corporation	Beginning of 2014	End of 2014
Direct materials inventory	130,000	68,000
Work-in-process inventory	166,000	144,000
Finished goods inventory	246,000	204,000
Purchases of direct materials		256,000
Direct manufacturing labor		212,000
Indirect manufacturing labor		96,000
Indirect materials		28,000
Plant insurance		4,000
Depreciation—plant, building, and equipment		42,000
Plant utilities		24,000
Repairs and maintenance—plant		16,000
Equipment leasing costs		64,000
Marketing, distribution, and customer-service costs		124,000
General and administrative costs		68,000

1. Prepare a schedule for the cost of goods manufactured for 2014.
2. Revenues (in thousands) for 2014 were \$1,200,000. Prepare the income statement for 2014.

Required

2-34 Income statement and schedule of cost of goods manufactured. The Howell Corporation has the following account balances (in millions):

For Specific Date		For Year 2014	
Direct materials inventory, Jan. 1, 2014	\$15	Purchases of direct materials	\$325
Work-in-process inventory, Jan. 1, 2014	10	Direct manufacturing labor	100
Finished goods inventory, Jan. 1, 2014	70	Depreciation—plant and equipment	80
Direct materials inventory, Dec. 31, 2014	20	Plant supervisory salaries	5
Work-in-process inventory, Dec. 31, 2014	5	Miscellaneous plant overhead	35
Finished goods inventory, Dec. 31, 2014	55	Revenues	950
		Marketing, distribution, and customer-service costs	240
		Plant supplies used	10
		Plant utilities	30
		Indirect manufacturing labor	60

Prepare an income statement and a supporting schedule of cost of goods manufactured for the year ended December 31, 2014. (For additional questions regarding these facts, see the next problem.)

Required

2-35 Interpretation of statements (continuation of 2-34).

1. How would the answer to Problem 2-34 be modified if you were asked for a schedule of cost of goods manufactured and sold instead of a schedule of cost of goods manufactured? Be specific.
2. Would the sales manager's salary (included in marketing, distribution, and customer-service costs) be accounted for any differently if the Howell Corporation were a merchandising-sector company instead of a manufacturing-sector company? Using the flow of manufacturing costs outlined in Exhibit 2-9 (page 43), describe how the wages of an assembler in the plant would be accounted for in this manufacturing company.
3. Plant supervisory salaries are usually regarded as manufacturing overhead costs. When might some of these costs be regarded as direct manufacturing costs? Give an example.

Required

4. Suppose that both the direct materials used and the plant and equipment depreciation are related to the manufacture of 1 million units of product. What is the unit cost for the direct materials assigned to those units? What is the unit cost for plant and equipment depreciation? Assume that yearly plant and equipment depreciation is computed on a straight-line basis.
5. Assume that the implied cost-behavior patterns in requirement 4 persist. That is, direct material costs behave as a variable cost and plant and equipment depreciation behaves as a fixed cost. Repeat the computations in requirement 4, assuming that the costs are being predicted for the manufacture of 1.2 million units of product. How would the total costs be affected?
6. As a management accountant, explain concisely to the president why the unit costs differed in requirements 4 and 5.

2-36 Income statement and schedule of cost of goods manufactured. The following items (in millions) pertain to Chester Corporation:

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

For Specific Date		For Year 2014	
Work-in-process inventory, Jan. 1, 2014	\$15	Plant utilities	\$ 6
Direct materials inventory, Dec. 31, 2014	9	Indirect manufacturing labor	25
Finished goods inventory, Dec. 31, 2014	19	Depreciation—plant and equipment	8
Accounts payable, Dec. 31, 2014	28	Revenues	354
Accounts receivable, Jan. 1, 2014	57	Miscellaneous manufacturing overhead	17
Work-in-process inventory, Dec. 31, 2014	7	Marketing, distribution, and customer-service costs	91
Finished goods inventory, Jan 1, 2014	43	Direct materials purchased	82
Accounts receivable, Dec. 31, 2014	30	Direct manufacturing labor	41
Accounts payable, Jan. 1, 2014	40	Plant supplies used	5
Direct materials inventory, Jan. 1, 2014	39	Property taxes on plant	3

Required

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

2-37 Terminology, interpretation of statements (continuation of 2-36).

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

Required

2-38 Labor cost, overtime, and idle time. Louie Anderson works in the production department of Southwest Plasticworks as a machine operator. Louie, a long-time employee of Southwest, is paid on an hourly basis at a rate of \$20 per hour. Louie works five 8-hour shifts per week Monday–Friday (40 hours). Any time Louie works over and above these 40 hours is considered overtime for which he is paid at a rate of time and a half (\$30 per hour). If the overtime falls on weekends, Louie is paid at a rate of double time (\$40 per hour). Louie is also paid an additional \$20 per hour for any holidays worked, even if it is part of his regular 40 hours. Louie is paid his regular wages even if the machines are down (not operating) due to regular machine maintenance, slow order periods, or unexpected mechanical problems. These hours are considered “idle time.”

During December Louie worked the following hours:

	Hours worked including machine downtime	Machine downtime
Week 1	48	6.4
Week 2	44	2.0
Week 3	43	5.8
Week 4	46	3.5

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

Required

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

2-39 Missing records, computing inventory costs. Ron Howard recently took over as the controller of Johnson Brothers Manufacturing. Last month, the previous controller left the company with little notice and left the accounting records in disarray. Ron needs the ending inventory balances to report first-quarter numbers.

For the previous month (March 2014) Ron was able to piece together the following information:

Direct materials purchased	\$120,000
Work-in-process inventory, 3/1/2014	\$ 35,000
Direct materials inventory, 3/1/2014	\$ 12, 500
Finished goods inventory, 3/1/2014	\$160,000
Conversion costs	\$330,000
Total manufacturing costs added during the period	\$420,000
Cost of goods manufactured	4 times direct materials used
Gross margin as a percentage of revenues	20%
Revenues	\$518,750

Calculate the cost of:

Required

1. Finished goods inventory, 3/31/2014
2. Work-in-process inventory, 3/31/2014
3. Direct materials inventory, 3/31/2014

2-40 Comprehensive problem on unit costs, product costs. Atlanta Office Equipment manufactures and sells metal shelving. It began operations on January 1, 2014. Costs incurred for 2014 are as follows (V stands for variable; F stands for fixed):

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

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

Inventory data are as follows:

	Beginning: January 1, 2014	Ending: December 31, 2014
Direct materials	0 lb	2,300 lbs
Work in process	0 units	0 units
Finished goods	0 units	? units

Production in 2014 was 115,000 units. Two pounds of direct materials are used to make one unit of finished product.

Revenues in 2014 were \$540,000. The selling price per unit and the purchase price per pound of direct materials were stable throughout the year. The company's ending inventory of finished goods is carried at the average unit manufacturing cost for 2014. Finished-goods inventory at December 31, 2014, was \$15,400.

Required

1. Calculate direct materials inventory, total cost, December 31, 2014.
2. Calculate finished-goods inventory, total units, December 31, 2014.
3. Calculate selling price in 2014.
4. Calculate operating income for 2014.

2-41 Cost classification; ethics. Jason Hand, the new plant manager of Old Tree Manufacturing Plant Number 7, has just reviewed a draft of his year-end financial statements. Hand receives a year-end bonus of 8% of the plant's operating income before tax. The year-end income statement provided by the plant's controller was disappointing to say the least. After reviewing the numbers, Hand demanded that his controller go back and "work the numbers" again. Hand insisted that if he didn't see a better operating income number the next time around he would be forced to look for a new controller.

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

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

Required

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

2-42 Finding unknown amounts. An auditor for the Internal Revenue Service is trying to reconstruct some partially destroyed records of two taxpayers. For each of the cases in the accompanying list, find the unknowns designated by the letters A through D.

	Case 1	Case 2
	(in thousands)	
Accounts receivable, 12/31	\$ 9,000	\$ 3,150
Cost of goods sold	A	30,000
Accounts payable, 1/1	4,500	2,550
Accounts payable, 12/31	2,700	2,250
Finished goods inventory, 12/31	B	7,950
Gross margin	16,950	C
Work-in-process inventory, 1/1	0	1,200
Work-in-process inventory, 12/31	0	4,500
Finished goods inventory, 1/1	6,000	6,000
Direct materials used	12,000	18,000
Direct manufacturing labor	4,500	7,500
Manufacturing overhead costs	10,500	D
Purchases of direct materials	13,500	10,500
Revenues	48,000	47,700
Accounts receivable, 1/1	3,000	2,100