



2 CHAPTER

Basic Cost Management Concepts

AFTER STUDYING THIS CHAPTER, YOU SHOULD BE ABLE TO:

1. Describe a cost management information system, its objectives, and its major subsystems, and indicate how it relates to other operating and information systems.
2. Explain the cost assignment process.
3. Define tangible and intangible products, and explain why there are different product cost definitions.
4. Prepare income statements for manufacturing and service organizations.
5. Explain the differences between traditional and contemporary cost management systems.

The study of cost accounting and cost management requires an understanding of fundamental cost concepts, terms, and the associated information systems that produce them. We need a basic framework to help us make sense of the variety of topics that appear in the field of cost accounting and cost management. A systems perspective provides a useful framework for achieving this objective. But what is an *information system*? Are there different systems for different purposes? Similarly, what is meant by *cost*? Are there different costs for different purposes? This chapter addresses these basic questions and provides the necessary foundation for the study of the rest of the text. In providing this foundation, we make no attempt to be exhaustive in our coverage of different systems and costs. Other system and cost concepts will be discussed in later chapters. However, a thorough understanding of the concepts presented in this chapter is essential for success with later chapters.

OBJECTIVE 1

Describe a cost management information system, its objectives, and its major subsystems, and indicate how it relates to other operating and information systems.

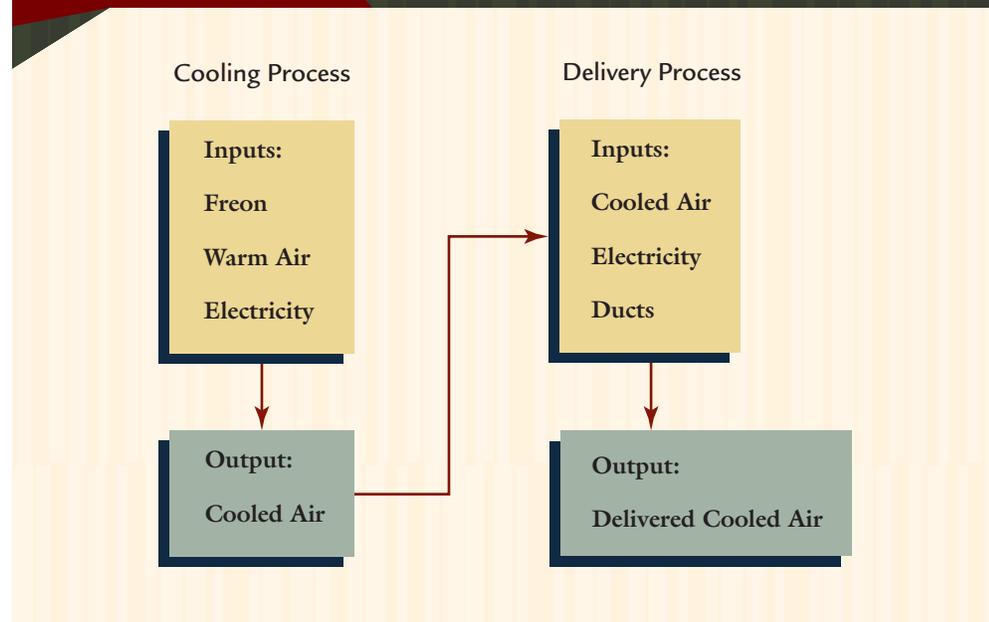
A Systems Framework

A **system** is a set of interrelated parts that performs one or more processes to accomplish specific objectives. Consider a home air-conditioning system. This system has a number of interrelated parts such as the compressor, the fan, the thermostat, and the duct work. The most obvious process (or series of actions designed to accomplish an objective) is the cooling of air; another is the delivery of cooled air to various rooms in the house. The primary objective of the system is to provide a comfortable, cool environment for people in the house. Notice that each part of the system is critical for achievement of the overall objective. For example, if the duct system were missing, the air conditioner would not be able to cool the house even if the other parts were present and functional.

But how does a system work? A system uses processes to transform inputs into outputs that satisfy the system's objectives. Consider the cooling process. This process requires inputs such as warm air, freon, and electricity. The inputs are transformed into cooled air, an output of the cooling process. The output of the process, cooled air, is obviously critical to achieving the overall objective of the system. The cooled air and energy become inputs to the delivery process. This process transforms the inputs so that a portion of the total cooled air is delivered to each room of the house (the output is delivered air). In this way, all rooms are cooled to the desired temperature, thereby achieving the system's objective. The operational model for the air-conditioning system is shown in Exhibit 2-1.

EXHIBIT 2-1

Operational Model of the Air-Conditioning System

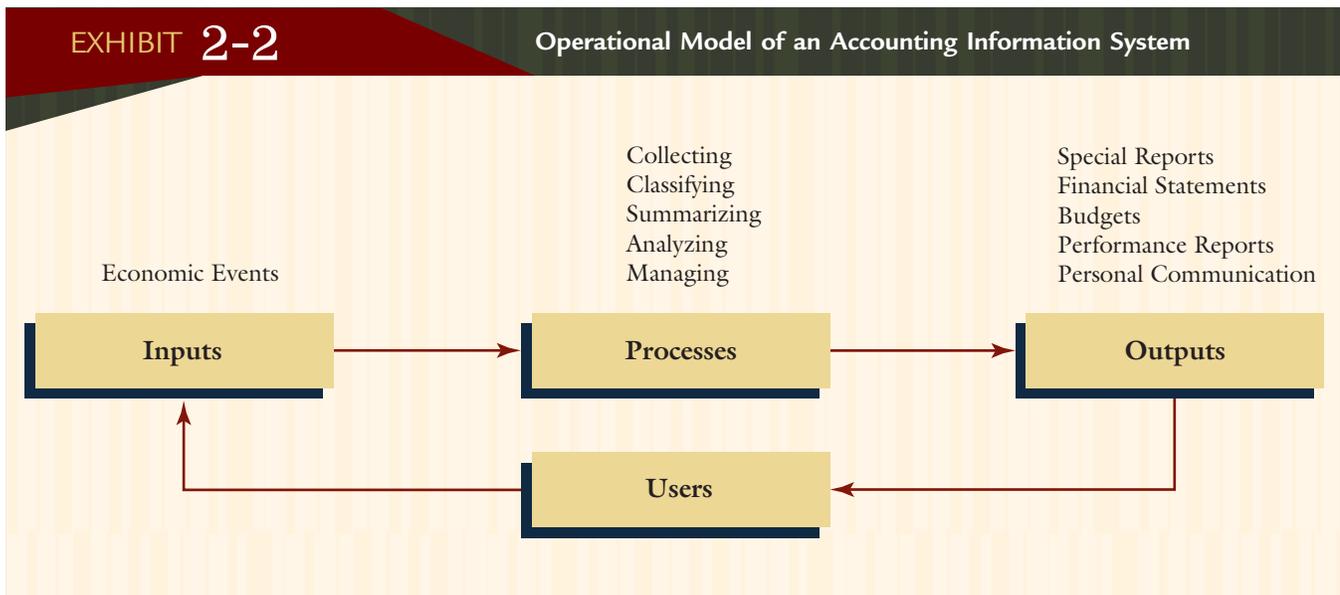


Accounting Information Systems

An information system is designed to provide information to people in the company who might need it. For example, the human resource (HR) information system and materials requirements planning (MRP) system are both information systems. The HR system tracks people as they are hired. It includes data on date of hire, entry-level title and salary/wages, and any information needed for determining employee benefits. The MRP is a computerized system that keeps track of all raw materials used in manufacturing.

An **accounting information system** is one that consists of interrelated manual and computer parts and uses processes such as collecting, recording, summarizing, analyzing, and managing data to provide information to users. Like any system, an accounting information system has objectives, interrelated parts, processes, and outputs. The overall objective of an accounting information system is to provide information to users. The interrelated parts include order entry and sales, billing accounts receivable and cash receipts, inventory, general ledger, and cost accounting. Each of these interrelated parts is itself a system and is therefore referred to as a *subsystem* of the accounting information system. Processes include such things as collecting, recording, summarizing, and managing data. Some processes may also be formal decision models—models that use inputs and provide recommended decisions as the information output. The outputs are data and reports that provide needed information for users.

Two key features of the accounting information system distinguish it from other information systems. First, inputs for an accounting information system are usually economic events. Second, the operational model of an accounting information system is critically involved with the user of information, since the output of the information system produces user actions. In some cases, the output may serve as the basis for action. This is particularly true for tactical and strategic decisions but less true for day-to-day decisions. In other cases, the output may serve to confirm that the actions taken had the intended effects.¹ Another possible user action is feedback, which becomes an input for subsequent operational system performance. The operational model for an accounting information system is illustrated in Exhibit 2-2. Examples of the inputs, processes, and outputs are provided in the exhibit. (The list is not intended to be exhaustive.) Notice that personal communication is an information output. Often, users may not wish to wait for formal reports and can obtain needed information on a more timely basis by communicating directly with accountants.



1. This role of information is described in William J. Bruns, Jr., and Sharon M. McKinnon, "Information and Managers: A Field Study," *Journal of Management Accounting Research* 5 (Fall 1993): 86–108. The paper reports on a field study of how managers use accounting information. The authors point out that formal information output does not seem to be used for day-to-day decisions. Managers often use interpersonal relationships to acquire information for daily use. Apparently, accessing information through informal channels provides more timely information than the formal information system.

The accounting information system can be divided into two major subsystems: (1) the *financial accounting information system* and (2) the *cost management information system*. We will emphasize the second, although it should be noted that the two systems need not be independent.² Ideally, the two systems should be integrated and have linked databases. Output of each of the two systems can be used as input for the other system.

Financial Accounting Information System

The **financial accounting information system** is primarily concerned with producing outputs for *external* users. It uses well-specified economic events as inputs, and its processes follow certain rules and conventions. For financial accounting, the nature of the inputs and the rules and conventions governing processes are defined by the Securities and Exchange Commission (SEC) and the Financial Accounting Standards Board (FASB). Among its outputs are financial statements such as the balance sheet, income statement, and statement of cash flows for external users (investors, creditors, government agencies, and other outside users). Financial accounting information is used for investment decisions, stewardship evaluation, activity monitoring, and regulatory measures.

The Cost Management Information System

The **cost management information system** is primarily concerned with producing outputs for *internal* users using inputs and processes needed to satisfy management objectives. The cost management information system is not bound by externally imposed criteria that define inputs and processes. Instead, the criteria that govern the inputs and processes are set by people in the company. The cost management information system has three broad objectives that provide information for:

1. Costing out services, products, and other objects of interest to management
2. Planning and control
3. Decision making

The information requirements for satisfying the first objective depend on the nature of the object being costed and the reason management wants to know the cost. For example, product costs calculated in accordance with GAAP are needed to value inventories for the balance sheet and to calculate the cost of goods sold expense on the income statement. These product costs include the cost of materials, labor, and overhead. In other cases, managers may want to know all costs that are associated with a product for purposes of tactical and strategic profitability analysis. If so, then additional cost information may be needed concerning product design, development, marketing, and distribution. For example, pharmaceutical companies may want to associate research and development costs with individual drugs or drug families.

Cost information is also used for planning and control. It should help managers decide what should be done, why it should be done, how it should be done, and how well it is being done. For example, information about the *expected* revenues and costs for a new product could be used as an input for target costing. At this stage, the expected revenues and costs may cover the entire life of the new product. Thus, projected costs of design, development, testing, production, marketing, distribution, and servicing would be essential information.

Finally, cost information is a critical input for many managerial decisions. For example, a manager may need to decide whether to continue making a component internally

2. Much of the material from this point on in this section relies on information found in the following articles: Robert S. Kaplan, "The Four-Stage Model of Cost Systems Design," *Management Accounting* (February 1990): 22–26; Steven C. Schnoebelen, "Integrating an Advanced Cost Management System into Operating Systems (Part 1)," *Journal of Cost Management* (Winter 1993): 50–54; and Steven C. Schnoebelen, "Integrating an Advanced Cost Management System into Operating Systems (Part 2)," *Journal of Cost Management* (Spring 1993): 60–67.

or to buy it from an external supplier. In this case, the manager would need to know the cost of materials, labor, and other productive inputs associated with the manufacture of the component and which of these costs would vanish if the product were no longer produced. Also needed is information concerning the cost of purchasing the component, including any increase in cost for internal activities such as receiving and storing goods.

Relationship to Other Operational Systems and Functions

The cost information produced by the cost management information system must benefit the organization as a whole. Thus, a high-quality cost management system should have an organization-wide perspective. Managers in many different areas of a business require cost information. For example, an engineering manager must make strategic decisions concerning product design. Costs of production, marketing, and servicing can vary widely, depending on the design. Having reliable and accurate cost information about different designs is clearly critical for sound decision making. To provide this cost information, the cost management system must not only interact with the design and development system but also with the production, marketing, and customer service systems. Cost information for tactical decision making is also important. For example, a sales manager needs reliable and accurate cost information when faced with a decision concerning an order that may be sold for less than the normal selling price. Such a sale may only be feasible if the production system is reporting idle capacity. In this case, a sound decision mandates interaction among the cost management system, the marketing and distribution system, and the production system. These two examples illustrate that the cost management system should have an organization-wide perspective and that it must be properly integrated with the nonfinancial functions and systems within an organization. In the past, little effort was made to integrate the cost management system with other operational systems. However, the current competitive environment dictates that companies pay much greater attention to cost management in all functional areas. Exhibit 2-3 illustrates the expected interactive relationships.

Exhibit 2-3 implies that the cost management system receives information from all operational systems and also supplies information to these systems. To the extent possible, the cost management system should be integrated with the organization's operational systems. Integration reduces redundant storage and use of data, improves the timeliness of information, and increases the efficiency of producing reliable and accurate information. One way of accomplishing this is to implement an enterprise resource planning (ERP) system. ERP systems strive to input data once and make it available to people across the company for whatever purpose it may serve. For example, a sales order entered into an ERP system is used by marketing to update customer records, by production to schedule the manufacture of the goods ordered, and by accounting to record the sale.

Different Systems for Different Purposes

The financial accounting and cost management systems show us that different systems exist to satisfy different purposes. As indicated, these two systems are subsystems of the accounting information system. The cost management information system also has two major subsystems: the *cost accounting information system* and the *operational control information system*. The objectives of these two subsystems correspond to the first and second objectives mentioned earlier for the cost management information system (the costing and control objectives). The output of these two cost systems satisfies the third objective (the decision-making objective).

The **cost accounting information system** is a cost management subsystem designed to assign costs to individual products and services and other objects as specified by management. For external financial reporting, the cost accounting system must as-



sign costs to products in order to value inventories and determine cost of sales. Furthermore, these assignments must conform to the rules and conventions set by the SEC and the FASB. These rules and conventions do not require that all costs assigned to individual products be causally related to the demands of individual products. Thus, using financial accounting principles to define product costs may lead to under- and overstatements of individual product costs. For reporting inventory values and cost of sales, this may not matter. Inventory values and cost of sales are reported in the aggregate, and the under- and overstatements may wash out to the extent that the values reported on the financial statements are reasonably accurate.

However, at the individual product level, distorted product costs can cause managers to make significant decision errors. For example, a manager might erroneously deemphasize and overprice a product that is, in reality, highly profitable. For decision making, accurate product costs are needed. If possible, the cost accounting system should produce product costs that simultaneously are accurate and satisfy financial reporting conventions. If not, then the cost system must produce two sets of product costs: one that satisfies financial reporting criteria and one that satisfies management decision-making needs.

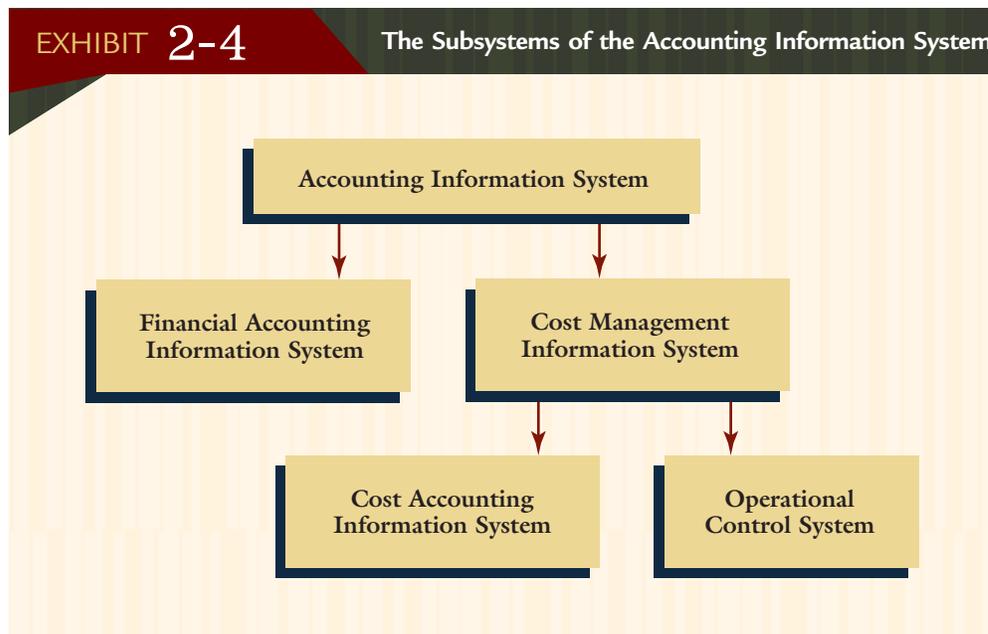
The **operational control information system** is a cost management subsystem designed to provide accurate and timely feedback concerning the performance of managers and others relative to their planning and control of activities. Operational control is concerned with what activities should be performed and assessing how well they are

performed. It focuses on identifying opportunities for improvement and helping to find ways to improve. A good operational control information system provides information that helps managers engage in a program of continuous improvement of all aspects of their businesses.

Product cost information plays a role in this process, but by itself, is not sufficient. The information needed for planning and control is broader and encompasses the entire value chain. For example, every profit making manufacturing and service organization exists to serve customers. Thus, one objective of an operational control system is to improve the value received by customers. Products and services should be produced that fit specific customer needs. (Observe how this affects the design and development system in the value chain.) Quality, affordable prices, and low post-purchase costs for operating and maintaining the product are also important to customers.

A second, related objective is to improve profits by providing this value. Well-designed, quality products that are affordable can be offered only if they also provide an acceptable return to the owners of the company. Cost information concerning quality, different product designs, and post-purchase customer needs is vital for managerial planning and control.³

Exhibit 2-4 illustrates the various subsystems of the accounting information system that we have been discussing.



Cost Assignment: Direct Tracing, Driver Tracing, and Allocation

To study cost accounting and operational control systems, it is necessary to understand the meaning of cost and to become familiar with the cost terminology associated with the two systems. One must also understand the process used to assign costs. Cost assignment is one of the key processes of the cost accounting system. Improving the cost

OBJECTIVE 2

Explain the cost assignment process.

3. The two objectives—improving customer value and improving profits by providing this value—are discussed in more detail in the following article: Peter B. B. Turney, “Activity-Based Management,” *Management Accounting* (January 1992): 20–25.

assignment process has been one of the major developments in the cost management field in recent years. Before discussing the cost assignment process, we first need to define what we mean by cost.

Cost is the cash or cash equivalent value sacrificed for goods and services that are expected to bring a current or future benefit to the organization. We say *cash equivalent* because noncash assets can be exchanged for the desired goods or services. For example, it may be possible to exchange equipment for materials used in production.

Costs are incurred to produce future benefits. In a profit making firm, future benefits usually mean revenues. As costs are used up in the production of revenues, they are said to expire. Expired costs are called **expenses**. In each period, expenses are deducted from revenues on the income statement to determine the period's profit. A **loss** is a cost that expires without producing any revenue benefit. For example, the cost of uninsured inventory destroyed by a flood would be classified as a loss on the income statement.

Many costs do not expire in a given period. These unexpired costs are classified as **assets** and appear on the balance sheet. Computers and factory buildings are examples of assets lasting more than one period. Note that the main difference between a cost being classified as an expense or as an asset is timing. This distinction is important and will be referred to in the development of other cost concepts later in the text.

Cost Objects

Management accounting systems are structured to measure and assign costs to cost objects. A **cost object** is any item, such as products, customers, departments, projects, activities, and so on, for which costs are measured and assigned. For example, if we want to determine what it costs to produce a bicycle, then the cost object is the bicycle. If we want to determine the cost of operating a maintenance department within a plant, then the cost object is the maintenance department. If we want to determine the cost of developing a new toy, then the cost object is the new toy development project. As a final example, activities should be mentioned. An **activity** is a basic unit of work performed within an organization. An activity can also be defined as an aggregation of actions within an organization useful to managers for purposes of planning, controlling, and decision making. In recent years, activities have emerged as important cost objects. Activities play a prominent role in assigning costs to other cost objects and are essential elements of an activity-based management accounting system. Examples of activities include setting up equipment for production, moving materials and goods, purchasing parts, billing customers, paying bills, maintaining equipment, expediting orders, designing products, and inspecting products. Notice that an activity is described by an action verb (e.g., paying and designing) and an object (e.g., bills and products) that receives the action. Notice also that the action verb and the object reveal very specific goals.

Accuracy of Assignments

Assigning costs *accurately* to cost objects is crucial. Our notion of accuracy is not evaluated based on knowledge of some underlying "true" cost. Rather, it is a relative concept and has to do with the reasonableness and logic of the cost assignment methods that are being used. The objective is to measure and assign as accurately as possible the cost of the resources used by a cost object. Some cost assignment methods are clearly more accurate than others. For example, suppose you want to determine the cost of lunch for Elaine Day, a student who frequents Hideaway, an off-campus pizza parlor. One cost assignment approach is to count the number of customers Hideaway has between 12:00 P.M. and 1:00 P.M. and then divide the total receipts earned by Hideaway during this period. Suppose that this divides out to \$4.50 per lunchtime customer. Thus, based on this approach we would conclude that Elaine spends \$4.50 per day for lunch. Another approach is to go with Elaine and observe how much she spends. Suppose that she has a

slice of pizza and a medium drink each day, costing \$2.50. It is not difficult to see which cost assignment is more accurate. The \$4.50 cost assignment is distorted by the consumption patterns of other customers (cost objects). As it turns out, most lunchtime clients order the luncheon special for \$4.99 (a mini-pizza, salad, and medium drink).

Distorted cost assignments can produce erroneous decisions and poor evaluations. For example, if a plant manager is trying to decide whether to continue producing power internally or to buy it from a local utility company, then an accurate assessment of how much it is costing to produce the power internally is fundamental to the analysis. If the cost of internal power production is overstated, the manager might decide to shut down the internal power department in favor of buying power from an outside company, whereas a more accurate cost assignment might suggest the opposite. It is easy to see that poor cost assignments can prove to be costly.

Traceability

The relationship of costs to cost objects can be exploited to help increase the accuracy of cost assignments. Costs are directly or indirectly associated with cost objects. **Indirect costs** are costs that cannot be traced easily and accurately to a cost object. **Direct costs** are those costs that can be traced easily and accurately to a cost object.⁴ For costs to be traced easily means that the costs can be assigned in an economically feasible way. For costs to be traced accurately means that the costs are assigned using a *causal relationship*. Thus, **traceability** is simply the ability to assign a cost directly to a cost object in an economically feasible way by means of a causal relationship. The more costs that can be traced to the object, the greater the accuracy of the cost assignments. Establishing traceability is a key element in building accurate cost assignments. One additional point needs to be emphasized. Cost management systems typically deal with many cost objects. Thus, it is possible for a particular cost item to be classified as both a direct cost and an indirect cost. It all depends on *which* cost object is the point of reference. For example, if the plant is the cost object, then the cost of heating and cooling the plant is a direct cost; however, if the cost objects are products produced in the plant, then this utility cost is an indirect cost.

Methods of Tracing

Traceability means that costs can be assigned easily and accurately, using a causal relationship. Tracing costs to cost objects can occur in one of two ways: (1) *direct tracing* and (2) *driver tracing*. **Direct tracing** is the process of identifying and assigning costs to a cost object that are specifically or physically associated with the cost object. Identifying costs that are specifically associated with a cost object is most often accomplished by *physical observation*. For example, assume that the power department is the cost object. The salary of the power department's supervisor and the fuel used to produce power are examples of costs that can be specifically identified (by physical observation) with the cost object (the power department). As a second example, consider a pair of blue jeans. The materials (denim, zipper, buttons, and thread) and labor (to cut the denim according to the pattern and sew the pieces together) are physically observable; therefore, the costs of materials and labor can be directly charged to a pair of jeans. Ideally, all costs should be charged to cost objects using direct tracing.

Unfortunately, it is often not possible to physically observe the exact amount of resources being consumed by a cost object. The next best approach is to use cause-and-effect reasoning to identify factors—called *drivers*—that can be observed and which measure a cost object's resource consumption. **Drivers** are factors that *cause* changes in

4. This definition of direct costs is based on the glossary prepared by Computer Aided Manufacturing-International, Inc. (CAM-I). See Norm Raffish and Peter B. B. Turney, "Glossary of Activity-Based Management," *Journal of Cost Management* (Fall 1991): 53–63. Other terms defined in this chapter and in the text also follow the CAM-I glossary.

resource usage, activity usage, costs, and revenues. **Driver tracing** is the use of *drivers* to assign costs to cost objects. Although less precise than direct tracing, driver tracing is very accurate if the cause-and-effect relationship is sound. Consider the cost of electricity for the jeans manufacturing plant. The factory manager might want to know how much electricity is used to run the sewing machines. Physically observing how much electricity is used would require a meter to measure the power consumption of the sewing machines, which may not be practical. Thus, a driver such as “machine hours” could be used to assign the cost of electricity. If the electrical cost per machine hour is \$0.50 and the sewing machines use 20,000 machine hours in a year, then \$10,000 of the electricity cost ($\$0.50 \times 20,000$) would be assigned to the sewing activity. The use of drivers to assign costs to activities will be explained in more detail in Chapter 4.

Assigning Indirect Costs

Indirect costs cannot be traced to cost objects. This means that there is no causal relationship between the cost and the cost object, or that tracing is not economically feasible. Assignment of indirect costs to cost objects is called **allocation**. Since no causal relationship exists, allocating indirect costs is based on *convenience* or some *assumed* linkage. For example, consider the cost of heating and lighting a plant that manufactures five products. Suppose that this utility cost is to be assigned to the five products. Clearly, it is difficult to see any causal relationship. A convenient way to allocate this cost is simply to assign it in proportion to the direct labor hours used by each product. Arbitrarily allocating indirect costs to cost objects reduces the overall accuracy of the cost assignments. Accordingly, the best costing policy may be that of assigning only traceable direct costs to cost objects. However, it must be admitted that allocations of indirect costs may serve other purposes besides accuracy. For example, allocating indirect costs to products may be required for external reporting. Nonetheless, most managerial uses of cost assignments are better served by accuracy. At the very least, direct and indirect cost assignments should be reported separately.

Cost Assignment Summarized

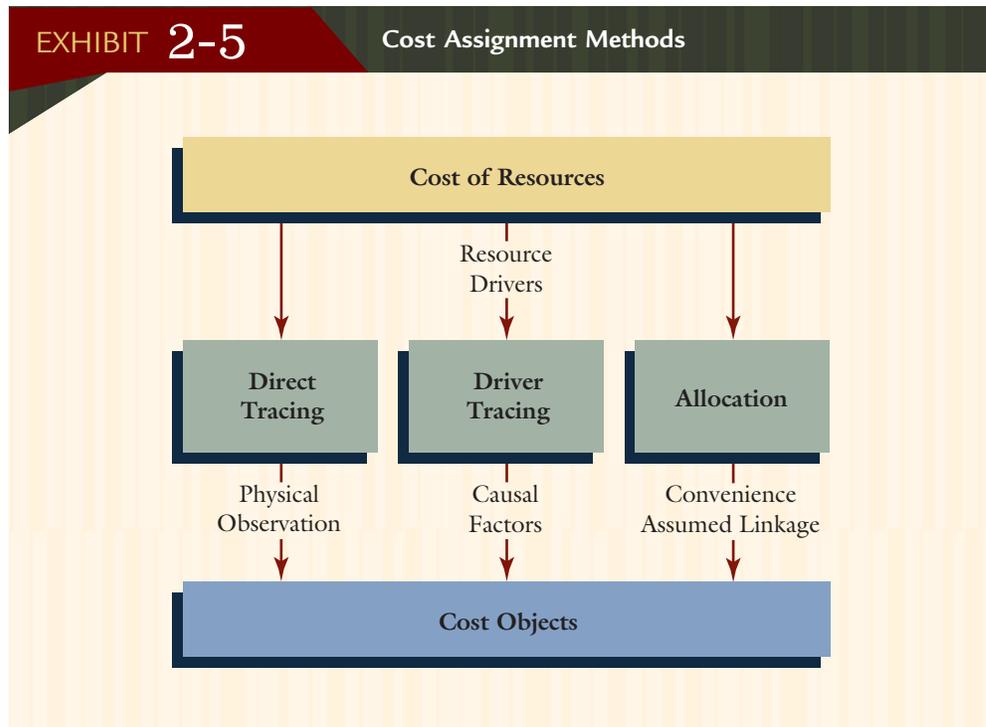
The foregoing discussion reveals three methods of assigning costs to cost objects: direct tracing, driver tracing, and allocation. These methods are illustrated in Exhibit 2-5. Of the three methods, direct tracing is the most precise since it relies on physically observable causal relationships. Direct tracing is followed by driver tracing in terms of cost assignment accuracy. Driver tracing relies on causal factors called drivers to assign costs to cost objects. The precision of driver tracing depends on the strength of the causal relationship described by the driver. Identifying drivers and assessing the quality of the causal relationship is much more costly than either direct tracing or allocation. In fact, one advantage of allocation is that it is simple and inexpensive to implement. However, allocation is the least accurate cost assignment method, and its use should be avoided where possible. In many cases, the benefits of increased accuracy by driver tracing outweigh its additional measurement cost. This cost-benefit issue is discussed more fully later in the chapter. What the process really entails is choosing among competing cost management systems.

OBJECTIVE 3

Define tangible and intangible products, and explain why there are different product cost definitions.

Product and Service Costs

One of the most important cost objects is the output of organizations. The two types of output are tangible products and services. **Tangible products** are goods produced by converting raw materials through the use of labor and capital inputs such as plant, land, and machinery. Televisions, hamburgers, automobiles, computers, clothes, and furniture are examples of tangible products. **Services** are tasks or activities performed for a customer or an activity performed by a customer using an organization’s products or facilities. Services are also produced using materials, labor, and capital inputs. Insurance coverage, medical care, dental care, funeral care, and accounting are examples of service



activities performed for customers. Car rental, video rental, and skiing are examples of services where the customer uses an organization's products or facilities.

Services differ from tangible products on three important dimensions: intangibility, perishability, and inseparability. **Intangibility** means that buyers of services cannot see, feel, hear, or taste a service before it is bought. Thus, services are *intangible products*. **Perishability** means that services cannot be stored (there are a few unusual cases where tangible goods cannot be stored). Finally, **inseparability** means that producers of services and buyers of services must usually be in direct contact for an exchange to take place. In effect, services are often inseparable from their producers. For example, an eye examination requires both the patient and the optometrist to be present. However, producers of tangible products need not have direct contact with the buyers of their goods. Buyers of automobiles, for instance, never need to have contact with the engineers and assembly line workers who produce automobiles.

Organizations that produce tangible products are called *manufacturing* organizations. Those that produce intangible products are called *service* organizations. Managers of organizations that produce goods or services need to know how much individual products cost for a number of reasons, including profitability analysis and strategic decisions concerning product design, pricing, and product mix. For example, **Fleming Co.**, an Oklahoma City-based food distributor, notes that separating the cost of products from the cost of servicing the retail customer is a key part of its flexible marketing plan.⁵ Individual product cost can refer to either a tangible or an intangible product. Thus, when we discuss product costs, we are referring to both intangible and tangible products.

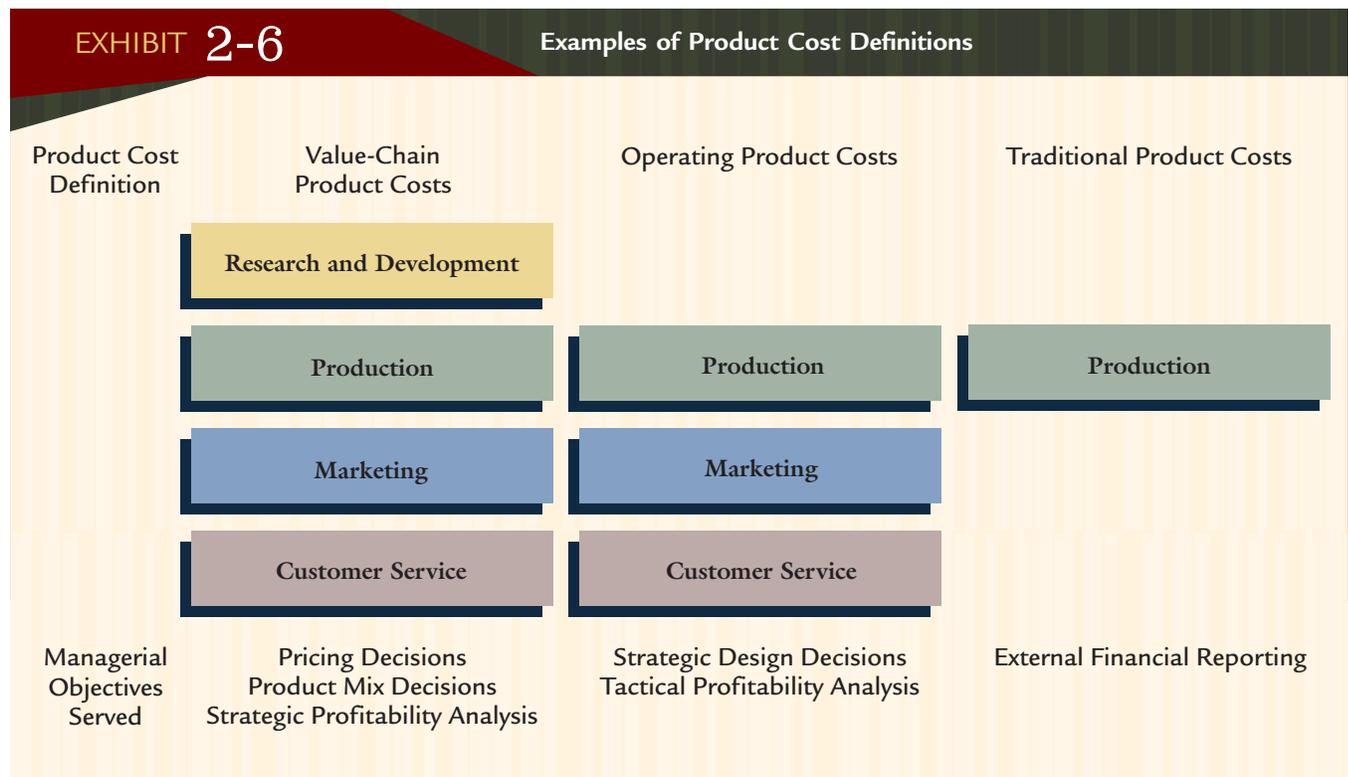
Different Costs for Different Purposes

A fundamental cost management principle is “Different costs for different purposes.” Thus, what a particular cost means depends on the managerial objective being served.

5. Glen A. Beres, “Fleming CEO Details Progress in Retooling,” *Supermarket News* (September 18, 1995): 6, 62.

This principle should not be used as a justification for proliferation of product costing methods. Using more product costing methods than necessary can be confusing and could undermine the credibility of the cost management information system.⁶

Product cost definitions can differ according to the objective being served. Exhibit 2-6 provides three examples of product cost definitions and some of the objectives they satisfy. For pricing decisions, product mix decisions, and strategic profitability analysis, all traceable costs along the value chain need to be assigned to the product. (The value chain is discussed in detail in Chapter 11.) For strategic product design decisions and tactical profitability analysis, costs for production, marketing, and customer service (including customer post-purchase costs) are needed. For external financial reporting, FASB rules and conventions mandate that only production costs be used in calculating product costs. Other objectives may use still other product cost definitions.



Product Costs and External Financial Reporting

An important objective of a cost management system is the calculation of product costs for external financial reporting. For product costing purposes, externally imposed conventions require costs to be classified in terms of the special purposes, or functions, they serve. Costs are subdivided into two major functional categories: production and nonproduction. **Production (or product) costs** are those costs associated with the manufacture of goods or the provision of services. **Nonproduction costs** are those costs associated with the functions of selling and administration. For tangible goods, production and nonproduction costs are often referred to as *manufacturing costs* and *nonmanufacturing costs*, respectively. Production costs can be further classified as *direct materials*, *direct labor*, and *overhead*. Only these three cost elements can be assigned to products for external financial reporting.

6. For further discussion of this point, see Steven C. Schnoebelen, "Integrating an Advanced Cost Management System into Operating Systems (Part 2)," *Journal of Cost Management* (Spring 1993): 60-67.

Direct Materials

Direct materials are those materials traceable to the good or service being produced. The cost of these materials can be directly charged to products because physical observation can be used to measure the quantity consumed by each product. Materials that become part of a tangible product or those materials that are used in providing a service are usually classified as direct materials. For example, steel in an automobile, wood in furniture, alcohol in cologne, denim in jeans, braces for correcting teeth, surgical gauze and anesthesia for an operation, ribbon in a corsage, and food on an airline are all direct materials.

Direct Labor

Direct labor is labor that is traceable to the goods or services being produced. As with direct materials, physical observation can be used to measure the quantity of labor used to produce a product or service. Employees who convert raw materials into a product or who provide a service to customers are classified as direct labor. Workers on an assembly line at **Chrysler**, a chef in a restaurant, a surgical nurse for an open-heart operation, and a pilot for **Delta Air Lines** are examples of direct labor.

Overhead

All production costs other than direct materials and direct labor are lumped into one category called **overhead**. In a manufacturing firm, overhead is also known as *factory burden* or *manufacturing overhead*. The overhead cost category contains a wide variety of items. Many inputs other than direct labor and direct materials are needed to produce products. Examples include depreciation on buildings and equipment, maintenance, supplies, supervision, materials handling, power, property taxes, landscaping of factory grounds, and plant security. **Supplies** are generally those materials necessary for production that do not become part of the finished product or are not used in providing a service. Dishwasher detergent in a fast-food restaurant and oil for production equipment are examples of supplies.

Direct materials that form an insignificant part of the final product are usually lumped into the overhead category as a special kind of indirect material. This is justified on the basis of cost and convenience. The cost of the tracing is greater than the benefit of increased accuracy. The glue used in making furniture or toys is an example.

The cost of overtime for direct labor is usually assigned to overhead as well. The rationale is that typically no particular production run can be identified as the cause of the overtime. Accordingly, overtime cost is common to all production runs and is therefore an indirect manufacturing cost. Note that *only* the overtime cost itself is treated this way. If workers are paid an \$8 regular rate and a \$4 overtime premium, then only the \$4 overtime premium is assigned to overhead. The \$8 regular rate is still regarded as a direct labor cost. In certain cases, however, overtime is associated with a particular production run, such as a special order taken when production is at 100 percent capacity. In these special cases, it is appropriate to treat overtime premiums as a direct labor cost.

Nonproduction Costs

Nonproduction costs are divided into two categories: marketing (selling) costs and administrative costs. For external financial reporting, marketing and administrative costs are not inventoried and are called *period costs*. **Period costs** are expensed in the period in which they are incurred. Thus, none of these costs can be assigned to products or appear as part of the reported values of inventories on the balance sheet. In a manufacturing organization, the level of these costs can be significant (often greater than 25 percent of sales revenue), and controlling them may bring greater cost savings than the same control exercised in the area of production costs. For example, **General Motors** offers employee wellness and fitness classes to help lower its staggering \$60 billion health care

costs.⁷ **Procter & Gamble**, on the other hand, spends enormous amounts on advertising in order to develop and dominate the market for shampoo and detergent in China. P&G buys more air time each month than even the most media-conscious Chinese companies spend in a year. Couple that with the cost of free samples and salaries for the thousands of Chinese who distribute them, we see that marketing expense in China is a significant portion of P&G's budget.⁸ For service organizations, the relative importance of selling and administrative costs depends on the nature of the service being produced. Physicians and dentists, for example, generally do very little marketing and thus have very low selling costs. An airline, on the other hand, may incur substantial marketing costs.

Those costs necessary to market and distribute a product or service are **marketing (selling) costs**. They are often referred to as *order-getting* and *order-filling* costs. Examples of marketing costs include the following: salaries and commissions of sales personnel, advertising, warehousing, shipping, and customer service. The first two items are examples of order-getting costs; the last three are order-filling costs.

All costs associated with the general administration of the organization that cannot be reasonably assigned to either marketing or production are **administrative costs**. General administration has the responsibility of ensuring that the various activities of the organization are properly integrated so the overall mission of the firm is realized. The president of the firm, for example, is concerned with the efficiency of *both* marketing and production as they carry out their respective roles. Proper integration of these two functions is essential for maximizing the overall profits of a firm. Examples, then, of administrative costs are top-executive salaries, legal fees, the annual report printing, and general accounting. An important subset of administrative costs is research and development. These costs are also expensed in the period in which they are incurred.

Prime and Conversion Costs

The manufacturing and nonmanufacturing classifications give rise to some related cost concepts. The functional delineation between nonmanufacturing and manufacturing costs is essentially the basis for the concepts of noninventoriable costs and inventoriable costs—at least for purposes of external reporting. Combinations of different production costs also produce the concepts of conversion costs and prime costs.

Prime cost is the sum of direct materials cost and direct labor cost. **Conversion cost** is the sum of direct labor cost and overhead cost. For a manufacturing firm, conversion cost can be interpreted as the cost of converting raw materials into a final product.

Exhibit 2-7 illustrates the various types of production and nonproduction costs.

OBJECTIVE 4

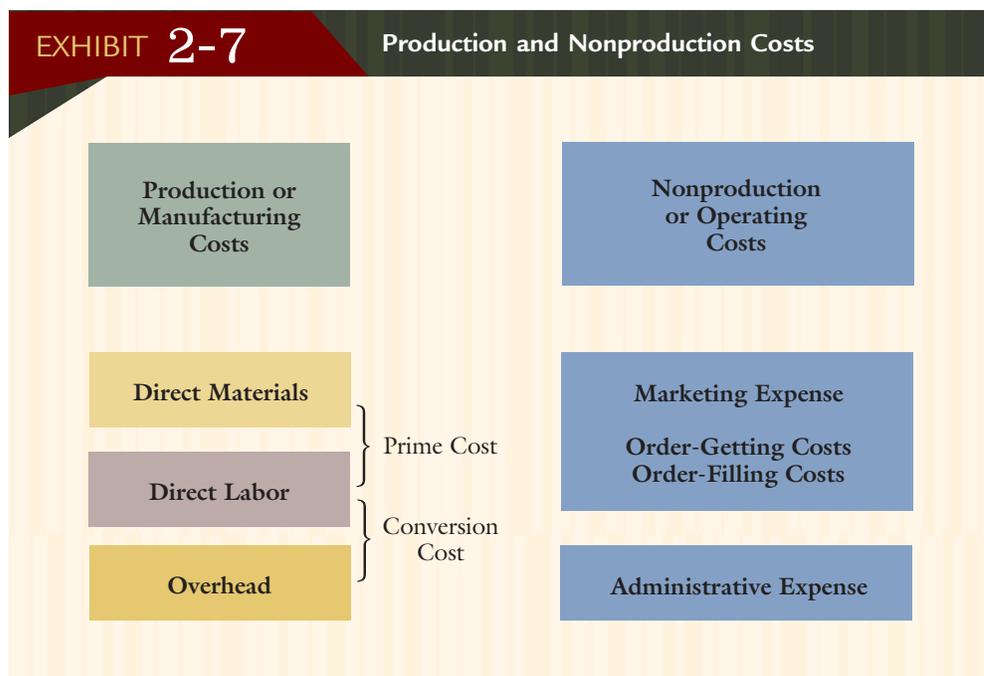
Prepare income statements for manufacturing and service organizations.

External Financial Statements

The functional classification is the cost classification required for external reporting. In preparing an income statement, production and nonproduction costs are separated. The reason for the separation is that production costs are product costs—costs that are inventoried until the units are sold—and the nonproduction costs of marketing and administration are viewed as period costs. Thus, production costs attached to the units sold are recognized as an expense (cost of goods sold) on the income statement. Production costs attached to units that are not sold are reported as inventory on the balance sheet. Marketing and administrative expenses are viewed as costs of the period and must be deducted each and every period as expenses on the income statement. Nonproduction costs never appear on the balance sheet.

7. Ed Garston, "GM Health Care Bill Tops \$60 Billion," *The Detroit News* (March 11, 2004), <http://www.detroitnews.com/2004/autoinsider/0403/11/a01-88813.htm>.

8. Joseph Kahn, "P&G Viewed China as a National Market and Is Conquering It," *The Wall Street Journal* (September 12, 1995): A1, A6.



Income Statement: Manufacturing Firm

The income statement based on a functional classification for a manufacturing firm is displayed in Exhibit 2-8. This income statement follows the standard format taught in an introductory financial accounting course. Income computed by following a functional classification is frequently referred to as **absorption-costing income** or **full-costing income** because *all* manufacturing costs are fully assigned to the product.

EXHIBIT 2-8 Income Statement: Manufacturing Organization

Manufacturing Organization Income Statement For the Year Ended December 31, 2007		
Sales		\$2,000,000
Less: Cost of goods sold		<u>1,300,000</u>
Gross margin		\$ 700,000
Less operating expenses:		
Selling expenses	\$300,000	
Administrative expenses	<u>150,000</u>	<u>450,000</u>
Operating income		<u>\$ 250,000</u>

Under the absorption-costing approach, expenses are separated according to function and then deducted from revenues to arrive at operating income. As can be seen in Exhibit 2-9, the two major functional categories of expense are cost of goods sold and operating expenses. These categories correspond, respectively, to a firm's manufacturing and nonmanufacturing expenses. **Cost of goods sold** is the cost of direct materi-

EXHIBIT 2-9

Statement of Cost of Goods Manufactured

**Statement of Cost of Goods Manufactured
For the Year Ended December 31, 2007**

Direct materials:		
Beginning inventory	\$200,000	
Add: Purchases	<u>450,000</u>	
Materials available	\$650,000	
Less: Ending inventory	<u>50,000</u>	
Direct materials used in production		\$ 600,000
Direct labor		350,000
Manufacturing overhead:		
Indirect labor	\$122,500	
Depreciation on building	177,500	
Rental of equipment	50,000	
Utilities	37,500	
Property taxes	12,500	
Maintenance	<u>50,000</u>	<u>450,000</u>
Total manufacturing costs added		\$1,400,000
Add: Beginning work in process		200,000
Less: Ending work in process		<u>400,000</u>
Cost of goods manufactured		<u>\$1,200,000</u>

als, direct labor, and overhead attached to the units sold. To compute the cost of goods sold, it is first necessary to determine the cost of goods manufactured. We will next look at two supporting schedules for the income statement: the cost of goods manufactured and the cost of goods sold schedule.

Cost of Goods Manufactured

The **cost of goods manufactured** represents the total manufacturing cost of goods completed during the current period. The only costs assigned to goods completed are the manufacturing costs of direct materials, direct labor, and overhead. The details of this cost assignment are given in a supporting schedule, called the *statement of cost of goods manufactured*. An example of this supporting schedule for the cost of goods sold schedule in Exhibit 2-10 is shown in Exhibit 2-9.

EXHIBIT 2-10

Cost of Goods Sold Schedule

**Cost of Goods Sold Schedule
For the Year Ended December 31, 2007**

Cost of goods manufactured	\$1,200,000
Add: Beginning inventory finished goods	<u>250,000</u>
Cost of goods available for sale	\$1,450,000
Less: Ending inventory finished goods	<u>150,000</u>
Cost of goods sold	<u>\$1,300,000</u>

Notice in Exhibit 2-9 that the *total manufacturing costs* of the period are added to the manufacturing costs found in beginning work in process. The costs found in ending work in process are then subtracted to arrive at the cost of goods manufactured. If the cost of goods manufactured is for a single product, then the average unit cost can be computed by dividing the cost of goods manufactured by the number of units produced. For example, assume that the statement in Exhibit 2-9 was prepared for the production of bottles of perfume and that 240,000 bottles were completed during the period. The average unit cost is \$5 per bottle ($\$1,200,000/240,000$).

Work in process consists of all partially completed units found in production at a given point in time. Beginning work in process consists of the partially completed units on hand at the beginning of a period. Ending work in process consists of those on hand at the period's end. In the statement of cost of goods manufactured, the cost of these partially completed units is reported as the cost of beginning work in process and the cost of ending work in process. The cost of beginning work in process represents the manufacturing costs carried over from the prior period; the cost of ending work in process represents the manufacturing costs that will be carried over to the next period. In both cases, additional manufacturing costs must be incurred to complete the units in work in process.

COST MANAGEMENT

Some dot coms are changing the way they structure their income statements. The differences are disclosed in the notes to the financial statements and don't affect the bottom line, but they do impact heavily the computation of sales and gross margin.

CDNow sends customers e-coupons for \$10 off their next purchase. Sounds like a purchase discount, doesn't it? Not at CDNow—instead the full purchase price is counted as sales and the \$10 discount as marketing expense. **Priceline.com** reported as revenue the full value of the airline tickets it sold, rather than the commission it collected on those sales.

Many catalog companies treat fulfillment costs as part of cost of goods sold. However, a recent **Amazon.com** 10-K filing noted, "Fulfillment costs included in marketing and sales expenses represent those costs incurred in operating and staffing distribution and customer service centers, including costs attributable to receiving, inspecting,

Technology in Action

and warehousing inventories; picking, packaging, and preparing customers' orders for shipment; and responding to inquiries from customers." If Amazon.com had accounted for those costs as cost of goods sold, its gross profit for the first quarter of 2000 would have fallen from \$128.1 million to \$28.6 million. Gross margin would have been 5 percent of sales, not the reported 22.3 percent. (Amazon.com's 2002 annual report shows that fulfillment costs continue to be treated as operating expenses rather than cost of goods sold. In 2001, fulfillment costs represented nearly 47 percent of Amazon.com's gross profit; in 2002, these costs represented nearly 40 percent of gross profit.)

Why do dot coms play these games? Because they divert investors' attention from the net loss shown on the bottom line and focus it on other parts of the financial statements. Thus, gross margin becomes important, as do revenues and growth in revenues.

Source: Taken from Andy Kessler, "CreativeAccounting.com," *The Wall Street Journal* (July 24, 2000), <http://interactive.swj.com/archive/retrieve.cgi?id=SB964396093512820667.djm>. Information on fulfillment costs and gross profit for the years 2001 and 2002 can be found in the 2002 annual report for Amazon.com at http://media.corporate-ir.net/media_files/irol/97/97664/reports/2002_Annual_Report_FINAL.pdf.

Cost of Goods Sold

Once the cost of goods manufactured statement is prepared, the cost of goods sold can be computed. The cost of goods sold is the manufacturing cost of the units that were sold during the period. It is important to remember that the cost of goods sold may or may not equal the cost of goods manufactured. In addition, we must remember that the cost of goods sold is an expense, and it belongs on the income statement. The cost of goods sold schedule for a manufacturing company is shown in Exhibit 2-10.

Income Statement: Service Organization

The income statement for a service organization looks very similar to the one shown in Exhibit 2-8 for a manufacturing organization. However, the cost of goods sold does differ in some key ways. For one thing, the service firm has no finished goods inventories since services cannot be stored, although it is possible to have work in process for services. For example, an architect may have drawings in process and an orthodontist may have numerous patients in various stages of processing for braces. Additionally, some service firms add order fulfillment costs to the cost of goods sold. For example, a catalog company such as **Lands' End** does not manufacture the items it sells. Instead, it adds value by purchasing products, arranging for the manufacture of particular designs, and providing catalogs and convenient 1-800-numbers. The cost of storing goods, picking and packing them, and shipping them to customers is shown as part of cost of goods sold.

OBJECTIVE 5
Explain the differences between traditional and contemporary cost management systems.

Functional-Based and Activity-Based Cost Management Systems

Cost management systems can be broadly classified as *functional-based* or *activity-based*.⁹ Both of these systems are found in practice. Currently, the functional-based cost management systems are more widely used than the activity-based systems. This is changing, however, as the need for highly accurate cost information increases. This is particularly true for organizations faced with increased product diversity, more product complexity, shorter product life cycles, increased quality requirements, and intense competitive pressures. These organizations often adopt a just-in-time manufacturing approach and implement advanced manufacturing technology (discussed in detail in Chapter 13). For firms operating in this advanced manufacturing environment, the functional-based cost management system may not work well. More relevant and timely cost information is needed for these organizations to build a sustainable long-term competitive advantage. Organizations must improve the value received by their customers while increasing their own profits at the same time. Better assessment of cost behavior, increased accuracy in product costing, and an attempt to achieve continuous cost improvement are all critical for the advanced manufacturing environment.

Functional-Based Cost Management Systems: A Brief Overview

Recall that cost management systems are made up of two subsystems: the cost accounting system and the operational control system. Thus, when discussing cost management systems, it is logical and convenient to discuss each subsystem separately. Of course, what is true for a subsystem is true for the overall cost management system.

Functional-Based Cost Accounting

A functional-based cost accounting system assumes that all costs can be classified as fixed or variable with respect to changes in the *units* or *volume* of product produced. Thus, units of product or other drivers highly correlated with units produced, such as direct labor hours and machine hours, are the only drivers *assumed* to be of importance. These unit- or volume-based drivers are used to assign production costs to products. A cost accounting system that uses only unit-based activity drivers to assign costs to

9. Both the functional-based costing system and the activity-based costing system are widely used in practice; sometimes they are used in the same company. As a result, this text integrates the treatment of the two types of costing systems.

cost objects is called a **functional-based cost system**. Since unit-based activity drivers usually are not the only drivers that explain causal relationships, much of the product cost assignment activity must be classified as allocation (recall that allocation is cost assignment based on *assumed* linkages or convenience). We can say, therefore, that functional-based cost accounting systems tend to be allocation-intensive.

The product costing objective of a functional-based cost accounting system is typically satisfied by assigning production costs to inventories and cost of goods sold for purposes of financial reporting. More comprehensive product cost definitions, such as the value-chain and operating cost definitions illustrated in Exhibit 2-6, are not available for management use. However, functional-based cost accounting systems often furnish useful variants of the traditional product cost definitions. For example, prime costs and variable manufacturing costs per unit may be reported. (Variable manufacturing costs are direct materials, direct labor, and variable overhead, where variable overhead is based on the number of units produced.)

Functional-Based Cost Control

A **functional-based operation control system** assigns costs to organizational units and then holds the organizational unit manager responsible for controlling the assigned costs. Performance is measured by comparing actual outcomes with standard or budgeted outcomes. The emphasis is on financial measures of performance (nonfinancial measures are usually ignored). Managers are rewarded based on their ability to control costs. This approach traces costs to individuals who are responsible for incurrence of costs. The reward system is used to motivate these individuals to manage costs. The approach assumes that maximizing the performance of the overall organization is achieved by maximizing the performance of individual organizational subunits (referred to as responsibility centers).

Activity-Based Cost Management Systems: A Brief Overview

Activity-based cost management systems have evolved in response to significant changes in the competitive business environment faced by both service and manufacturing firms. The overall objective of an activity-based cost management system is to improve the quality, content, relevance, and timing of cost information.¹⁰ Generally, more managerial objectives can be met with an activity-based system than with a functional-based system.

Activity-Based Cost Accounting

An activity-based cost accounting system emphasizes tracing over allocation. The role of driver tracing is significantly expanded by identifying drivers unrelated to the volume of product produced (called *non-unit-based activity drivers*). The use of both unit- and non-unit-based activity drivers increases the accuracy of cost assignments and the overall quality and relevance of cost information. A cost accounting system that uses both unit- and non-unit-based activity drivers to assign costs to cost objects is called an **activity-based cost (ABC) system**. For example, consider the activity of “moving raw materials and partially finished goods from one point to another within a factory.” The number of moves required for a product is a much better measure of the product’s demand for the materials handling activity than the number of units produced. In fact, the number of units produced may have nothing to do whatsoever with measuring products’ demands for materials handling. (A batch of 10 units of one product could require as much materials handling activity as a batch of 100 units of another

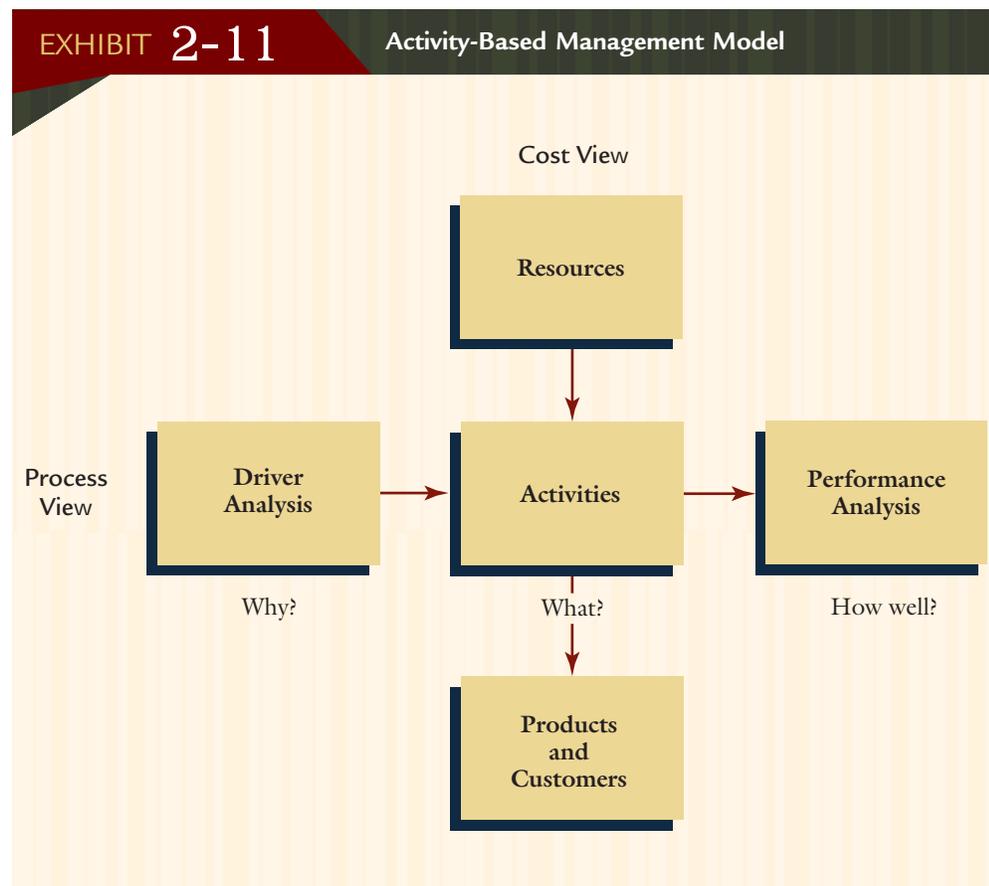
10. Steven C. Schnoebelen, “Integrating an Advanced Cost Management System into Operating Systems (Part 1),” *Journal of Cost Management* (Winter 1993): 50–54.

product.) Thus, we can say that an activity-based cost accounting system tends to be tracing-intensive.

Product costing in an activity-based system tends to be flexible. The activity-based cost management system is capable of producing cost information for a variety of managerial objectives, including the financial reporting objective. More comprehensive product costing definitions are emphasized for better planning, control, and decision making. Therefore, the maxim of “different costs for different purposes” takes on real meaning.

Activity-Based Cost Control

The activity-based operational control subsystem also differs significantly from that of a functional-based system. The emphasis of the traditional cost management accounting system is on managing costs. The emerging consensus, however, is that management of activities—not costs—is the key to successful control in the advanced manufacturing environment. Hence, *activity-based management* is the heart and soul of a contemporary operational control system. **Activity-based management (ABM)** focuses on the management of activities with the objective of improving the value received by the customer and the profit received by the company in providing this value. It includes driver analysis, activity analysis, and performance evaluation and draws on ABC as a major source of information.¹¹ In Exhibit 2-11, the vertical dimension traces the



11. This definition of activity-based management and the illustrative model in Exhibit 2-11 are based on the following source: Norm Raffish and Peter B. B. Turney, “Glossary of Activity-Based Management,” *Journal of Cost Management* (Fall 1991): 53–63. Other terms throughout the text relating to activity-based management are also drawn from this source.

cost of resources to activities and then to the cost objects. This is the activity-based costing dimension (referred to as the *cost view*). It serves as an important input to the control dimension, which is called the *process view*. The process view identifies factors that cause an activity's cost (explains why costs are incurred), assesses what work is done (identifies activities), and evaluates the work performed and the results achieved (how well the activity is performed). Thus, an activity-based control system requires detailed information on activities.

This new approach focuses on accountability for activities rather than costs and emphasizes the maximization of systemwide performance instead of individual performance. Activities cut across functional and departmental lines, are systemwide in focus, and require a global approach to control. Essentially, this form of control admits that maximizing the efficiency of individual subunits does not necessarily lead to maximum efficiency for the system as a whole. Another significant difference also should be mentioned. In the ABM operational control information system, both financial and non-financial measures of performance are important. Exhibit 2-12 compares the characteristics of the functional-based and activity-based cost management systems.

EXHIBIT 2-12		Comparison of Functional-Based and Activity-Based Cost Management Systems	
Functional-Based			Activity-Based
Unit-based drivers			Unit- and non-unit-based drivers
Allocation-intensive			Tracing-intensive
Narrow and rigid product costing			Broad, flexible product costing
Focus on managing costs			Focus on managing activities
Sparse activity information			Detailed activity information
Maximization of individual unit performance			Systemwide performance maximization
Uses financial measures of performance			Uses both financial and nonfinancial measures of performance

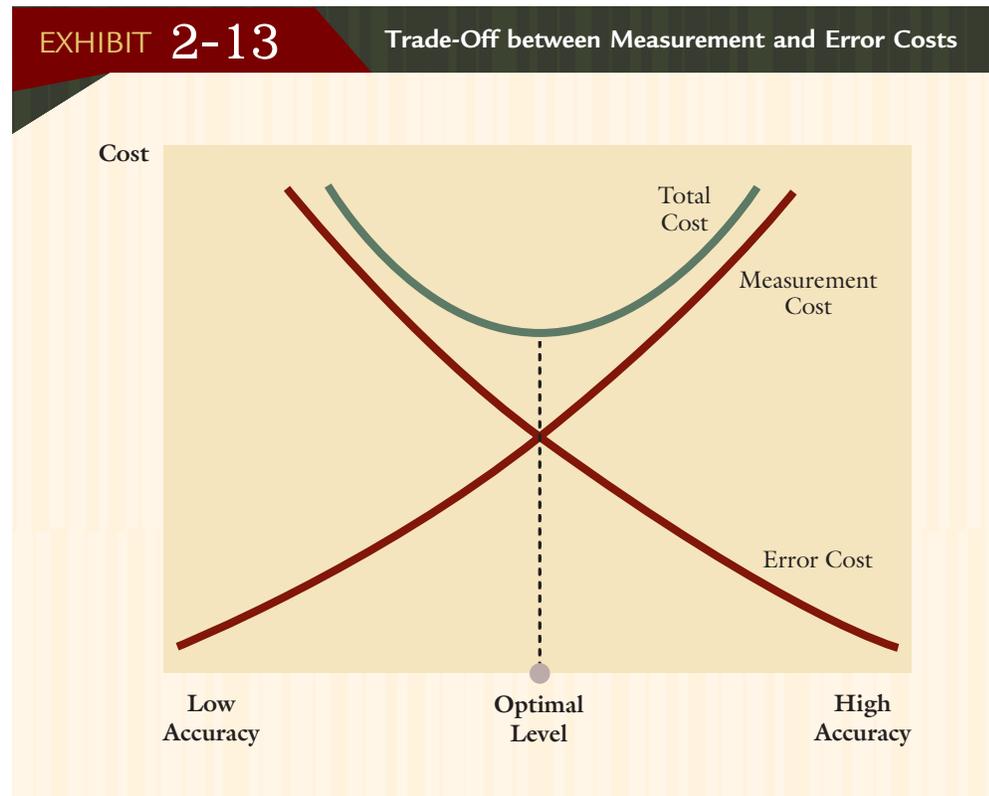
Choice of a Cost Management System

An activity-based cost management system offers significant benefits, including greater product costing accuracy, improved decision making, enhanced strategic planning, and an increased ability to manage activities. These benefits, however, are not cost-free. An activity-based cost management system is more complex and requires a significant increase in measurement activity—and measurement can be costly.

In deciding whether to implement an activity-based cost management system, a manager must assess the trade-off between the cost of measurement and the cost of errors.¹² **Measurement costs** are the costs associated with the measurements required by the cost management system. **Error costs** are the costs associated with making poor decisions based on inaccurate product costs or, more generally, bad cost information. Optimally, a cost management system would minimize the sum of measurement and error costs. Note, however, that the two costs conflict. More complex cost management systems produce lower error costs but have higher measurement costs. (Consider, for example, the number of activities that must be identified and analyzed, along with the number of drivers that must be used to assign costs to products.) The trade-off be-

12. The discussion of these issues is based on the following article: Robin Cooper, "The Rise of Activity-Based Costing—Part Two: When Do I Need an Activity-Based Cost System?" *Journal of Cost Management* (Summer 1988): 45-54.

tween error and measurement costs is illustrated in Exhibit 2-13. The message is clear. For some organizations, the optimal cost system may not be an ABM system even though it is a more accurate system. Depending on the trade-offs, the optimal cost management system may very well be a simpler, functional-based system. This could explain, in part, why most firms still maintain this type of system.



Recent changes in the manufacturing environment, however, are increasing the attractiveness of more accurate, yet complex, cost management systems. New information technology decreases measurement costs; computerized production planning systems and more powerful, less expensive computers make it easier to collect data and perform calculations. As measurement costs decrease, the measurement cost curve shown in Exhibit 2-13 shifts downward and to the right, causing the total cost curve to shift to the right. The optimal cost management system is now one that allows more accuracy.

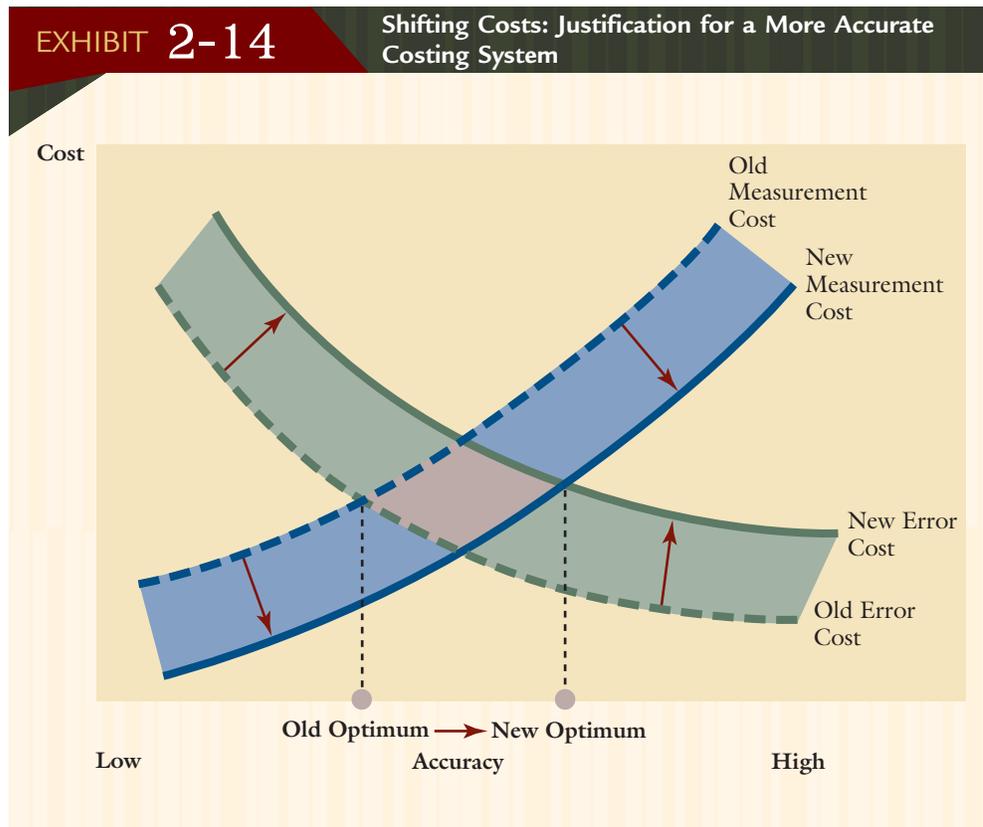
As the cost of measurement has decreased, the cost of errors has increased. Basically, errors consist of over- or undercosting products. If competition heats up for an overcosted product, the firm may drop what now *appears* to be an unprofitable product. If the nature of the competition changes, error costs can increase as well. For example, if single-product-focused competitors emerge, then their pricing and marketing strategies will be based on more accurate cost information (since all costs are known to belong to the single product). Because of better cost information, the more focused firms may gain market share at the expense of multiple-product producers (whose cost systems may be allocating rather than tracing costs to individual products). Other factors such as deregulation and JIT manufacturing (which leads to a more focused production environment) can also increase the cost of errors. As the cost of errors increases, the error-cost curve in Exhibit 2-13 shifts upward and to the right, causing the total cost curve to shift to the right, making a more accurate cost system the better choice.

Another cost, which is increasing for some firms, is the cost of unethical conduct. For example, **Metropolitan Life Insurance Company** paid over \$20 million in fines and must refund more than \$50 million to policyholders because some of its agents

illegally sold policies as retirement plans.¹³ An ABM system which tracks policy sales by type, age of policyholder, agent, and policyholder's objective could give an early warning signal of problems. A key point is that companies are expected to exercise control over their operations. If there is room for ethical misconduct, the company must develop the means to identify and correct abuses. As the cost of measurement decreases and the cost of errors increases, the existing cost management system is no longer optimal. Exhibit 2-14 illustrates how changing error and measurement costs can make an existing cost management system obsolete. As the exhibit illustrates, a more accurate cost management system is mandated because of changes in error and measurement costs. Firms, then, should consider implementing an ABM system if they have experienced a decrease in measurement costs and an increase in error costs. Although the majority of firms still use a functional-based cost management system, the use of activity-based costing and activity-based management is spreading, and interest in contemporary cost management systems is high. Firms like the following have adopted activity-based costing and management systems:¹⁴

- Hughes Aircraft
- Caterpillar
- Xerox
- National Semiconductor
- Tektronix
- Dayton Technologies
- Armistead Insurance

This is only a very small listing of firms that are using more contemporary systems.



13. Chris Roush, "Fields of Green—And Disaster Areas," *Business Week* (January 9, 1995): 94.

14. Peter B. B. Turney, "Activity-Based Management," *Management Accounting* (January 1992): 20–25; Jack Hedicke and David Feil, "Hughes Aircraft," *Management Accounting* (February 1991): 29–33; and Lou F. Jones, "Product Costing at Caterpillar," *Management Accounting* (February 1991): 34–42.

SUMMARY

A systems framework affords a logical basis for the study of cost management. The cost management system is a subsystem of the accounting information system and must be designed to satisfy costing, controlling, and decision-making objectives. The costing and controlling objectives serve to define two major subsystems: the cost accounting system and the operational control system.

A major feature of the operational model of the cost accounting system is the cost assignment process. The major objective of the cost accounting system is the assignment of costs to cost objects. This assignment process is achieved by three subprocesses: direct tracing, driver tracing, and allocation. Allocation is the least accurate and least desirable approach, and generally, a cost accounting system should be designed to minimize allocations. Understanding the assignment process is fundamental to understanding cost management systems. In this chapter, you need to grasp the broad, conceptual framework for cost assignment. Subsequent chapters will explore the mechanics of cost assignment in greater detail.

Product and service costs were also introduced. Several product cost definitions were provided. The product cost definition for external financial reporting is of particular importance and was discussed in detail. The format for external income statements was presented and discussed for both manufacturing and service firms. Given the increasing magnitude of the service sector, you should pay particular attention to what services are and how they differ from tangible products. Cost management for service organizations will receive more emphasis in this text than is traditionally available.

Finally, we discussed the difference between functional-based and activity-based cost management systems. Exhibit 2-12 lists some of the major differences between the two systems and should be studied carefully. Again, the objective is simply to provide a broad, conceptual understanding of the differences. An in-depth, detailed understanding of the differences will come only after studying the chapters that focus on the different types of systems.

REVIEW PROBLEMS AND SOLUTIONS

1 TYPES OF COSTS, COST OF GOODS MANUFACTURED, ABSORPTION-COSTING INCOME STATEMENT

Palmer Manufacturing produces weather vanes. For the year just ended, Palmer produced 10,000 weather vanes with the following total costs:

Direct materials	\$20,000
Direct labor	35,000
Overhead	10,000
Selling expenses	6,250
Administrative expenses	14,400

During the year, Palmer sold 9,800 units for \$12 each. Beginning finished goods inventory consisted of 630 units with a total cost of \$4,095. There were no beginning or ending inventories of work in process.

Required:

1. Calculate the unit costs for the following: direct materials, direct labor, overhead, prime cost, and conversion cost.
2. Prepare schedules for cost of goods manufactured and cost of goods sold.
3. Prepare an absorption-costing income statement for Palmer Manufacturing.

SOLUTION

1. Unit direct materials = $\$20,000/10,000 = \2.00
 Unit direct labor = $\$35,000/10,000 = \3.50
 Unit overhead = $\$10,000/10,000 = \1.00
 Unit prime cost = $\$2.00 + \$3.50 = \$5.50$
 Unit conversion cost = $\$3.50 + \$1.00 = \$4.50$

2. Statement of cost of goods manufactured:

Direct materials used	\$20,000
Direct labor	35,000
Overhead	<u>10,000</u>
Total manufacturing costs added	\$65,000
Add: Beginning work in process	0
Less: Ending work in process	<u>(0)</u>
Cost of goods manufactured	<u><u>\$65,000</u></u>

Cost of goods sold schedule:

Cost of goods manufactured	\$65,000
Add: Beginning finished goods inventory	4,095
Less: Ending finished goods inventory*	<u>(5,395)</u>
Cost of goods sold	<u><u>\$63,700</u></u>

*Units in ending finished goods inventory = $10,000 + 630 - 9,800 = 830$;
 $830 \times (\$2.00 + \$3.50 + \$1.00) = \$5,395$.

3. Income statement:

Sales ($9,800 \times \$12$)	\$117,600
Less: Cost of goods sold	<u>63,700</u>
Gross margin	\$ 53,900
Less: Operating expenses:	
Selling expenses	\$ 6,250
Administrative expenses	<u>14,400</u>
Operating income	<u><u>\$ 33,250</u></u>

2 SYSTEMS CONCEPTS

Kate Myers is a student at Midwestern University. Her system for tracking finances includes the following. Kate has two credit cards; each day she places the receipts for any items purchased on credit in a manila envelope on her desk. She checks these receipts against the credit card bills at the end of the month. Any other financial item that Kate thinks might be useful later is also placed into the envelope. (An example would be a payroll stub from her job as a worker in the dormitory cafeteria.) Kate records any check written in her checkbook register at the time she writes it. Shortly after her bank statement arrives, she enters any checks written and deposits made into Quicken® (the software program she uses to balance her checkbook). She then reconciles her bank statement against the Quicken account and prints a reconciliation report. From time to

time, Kate phones home to ask her mother to add more money to her bank account. Her mother, who has copies of the deposit slips for Kate's account, mails a check (from her own account) with a deposit slip to Kate's account. Whenever this occurs, Kate logs on to Bluemountain.com and e-mails her mother an electronic thank-you card.

The following items are associated with this financial system:

- a. Manila envelope
- b. Checkbook
- c. Checks and deposit slips
- d. Computer and printer
- e. Quicken program
- f. Credit cards
- g. Credit card receipts
- h. Payroll stubs, etc.
- i. Monthly bank statements
- j. Reconciliation report
- k. Phone

Required:

1. What are the objectives of Kate's financial system? What processes can you identify?
2. Classify the items into one of the following categories:
 - a. Interrelated parts
 - b. Inputs
 - c. Outputs
3. Draw an operational model for the financial system.

SOLUTION

1. The objectives of Kate's financial system are to keep Kate financially solvent and to provide a clear and accurate picture of her checking account balance and bills incurred at any point in time. Processes include filing the credit card receipts, entering checks written and deposits made into both the manual and computerized systems, reconciling the bank statement with the computerized system, phoning home for additional funds, and e-mailing a thank-you card.
2. The items are classified as follows:
 - a. Manila envelope—interrelated part
 - b. Checkbook—interrelated part
 - c. Checks and deposit slips—input
 - d. Computer and printer—interrelated part
 - e. Quicken program—interrelated part
 - f. Credit cards—interrelated part
 - g. Credit card receipts—input
 - h. Payroll stubs, etc.—input
 - i. Monthly bank statements—interrelated part
 - j. Reconciliation report—output
 - k. Phone—interrelated part
3. Operational model of Kate's financial system:

<i>Inputs</i>	<i>Processes</i>	<i>Objectives</i>
Checks	Filing credit card receipts	Stay financially solvent
Deposit slips	Entering checks/deposits	Be aware of bills incurred
Credit card receipts	Reconciling statements	Know account balance
Payroll stubs, etc.	Phoning for additional funds	
	E-mailing thank-you card	

KEY TERMS

- Absorption-costing income 42
Accounting information system 30
Activity 35
Activity-based cost (ABC) system 46
Activity-based management (ABM) 47
Administrative costs 41
Allocation 37
Assets 35
Conversion cost 41
Cost 35
Cost accounting information system 32
Cost management information system 31
Cost object 35
Cost of goods manufactured 43
Cost of goods sold 42
Direct costs 36
Direct labor 40
Direct materials 40
Direct tracing 36
Driver tracing 37
Drivers 36
Error costs 48
Expenses 35
Financial accounting information system 31
Full-costing income 42
Functional-based cost system 46
Functional-based operation control system 46
Indirect costs 36
Inseparability 38
Intangibility 38
Loss 35
Marketing (selling) costs 41
Measurement costs 48
Nonproduction costs 39
Operational control information system 33
Overhead 40
Period costs 40
Perishability 38
Prime cost 41
Production (or product) costs 39
Services 37
Supplies 40
System 29
Tangible products 37
Traceability 36
Work in process 44

QUESTIONS FOR WRITING AND DISCUSSION

1. What is an accounting information system?
2. What is the difference between a financial accounting information system and a cost management information system?
3. What are the objectives of a cost management information system?
4. Define and explain the two major subsystems of the cost management information system.
5. What is a cost object? Give some examples.
6. What is an activity? Give some examples of activities within a manufacturing firm.
7. What is a direct cost? An indirect cost?
8. What does traceability mean?
9. What is allocation?
10. Explain how driver tracing works.
11. What is a tangible product?
12. What is a service? Explain how services differ from tangible products.
13. Give three examples of product cost definitions. Why do we need different product cost definitions?

14. Identify the three cost elements that determine the cost of making a product (for external reporting).
15. How do the income statements of a manufacturing firm and a service firm differ?

EXERCISES

2-1 SYSTEMS CONCEPTS

- LO1** In general, systems are described by the following pattern: (1) interrelated parts, (2) processes, and (3) objectives. Operational models of systems also identify inputs and outputs.

The dishwashing system of a college cafeteria consists of the following steps. First, students dispose of any waste paper (e.g., napkins) in a trash can, then they file by an opening to the dishwashing area and drop off their trays. Persons 1 and 2 take the trays; rinse the extra food down the disposal; and stack the dishes, glasses, and silverware in heavy-duty plastic racks. These racks slide along a conveyor into the automatic dishwasher. When the racks emerge from the other end of the dishwasher, they contain clean, germ-free items. Person 3 removes the racks and, with Person 4, empties them of clean items; stacking the dishes, silverware, glasses, and trays for future use. The empty racks are returned to the starting position in front of Persons 1 and 2. The following items are associated with this dishwashing system:

- a. Automatic dishwasher
- b. Racks to hold the dirty glasses, silverware, and dishes
- c. Electricity
- d. Water
- e. Waste disposal
- f. Sinks and sprayers
- g. Dish detergent
- h. Gas heater to heat water to 180 degrees Fahrenheit
- i. Conveyor belt
- j. Persons 1, 2, 3, and 4
- k. Clean, germ-free dishes
- l. Dirty dishes
- m. Half-eaten dinner
- n. Aprons

Required:

1. What is the objective of the dishwashing system? What processes can you identify?
2. Classify the items into one of the following categories:
 - a. Interrelated parts
 - b. Inputs
 - c. Outputs
3. Draw an operational model for the dishwashing system.
4. Discuss how a cost management information system is similar to and different from the dishwashing system.

2-2 COST ACCOUNTING INFORMATION SYSTEM

- LO1** The following items are associated with a cost accounting information system:
- a. Usage of direct materials
 - b. Assignment of direct materials cost to each product

- c. Direct labor cost incurrence
- d. Depreciation on production equipment
- e. Cost accounting personnel
- f. Submission of a bid, using product cost plus 25 percent
- g. Power cost incurrence
- h. Materials handling cost incurrence
- i. Computer
- j. Assignment of direct labor costs to products
- k. Costing out of products
- l. Decision to continue making a part rather than buying it
- m. Printer
- n. Report detailing individual product costs
- o. Assignment of overhead costs to individual products

Required:

1. Classify the preceding items into one of the following categories:
 - a. Interrelated parts
 - b. Processes
 - c. Objectives
 - d. Inputs
 - e. Outputs
 - f. User actions
2. Draw an operational model that illustrates the cost accounting information system—with the preceding items used as examples for each component of the model.
3. Based on your operational model, identify which product cost definition is being used: value-chain, operating, or functional-based manufacturing.

2-3 COST ASSIGNMENT METHODS

LO2 Tasman Company produces electric tools including drills, nail guns, circular saws, and routers. Recently, Tasman switched from a traditional departmental assembly line system to a manufacturing cell in order to produce a specialized jig saw. Suppose that the jig saw manufacturing cell is the cost object. Assume that all or a portion of the following costs must be assigned to the cell:

- a. Depreciation on the plant
- b. Salary of cell supervisor
- c. Power to heat and cool the plant in which the cell is located
- d. Heavy duty steel used to produce the jig saw housings
- e. Maintenance for the cell's equipment (provided by the maintenance department)
- f. Labor used to align the steel in the stamping machine to produce the halves of the jig saw housing
- g. Cost of janitorial services for the plant
- h. Depreciation on stamping machines and automatic continuous welders used to produce the jig saws
- i. Ordering costs for materials used in production
- j. The salary of the industrial engineer (half of whose time is dedicated to the cell)
- k. Cost of maintaining plant and grounds
- l. Cost of plant's personnel office
- m. Oil to lubricate the stamping machines
- n. Plant receptionist's salary and benefits

Required:

Identify which cost assignment method would likely be used to assign the costs of each of the preceding activities to the jig saw manufacturing cell: direct tracing, driver trac-

ing, or allocation. When driver tracing is selected, identify a potential activity driver that could be used for the tracing.

2-4 PRODUCT COST DEFINITIONS

LO3 Three possible product cost definitions were introduced: (1) value-chain, (2) operating, and (3) manufacturing. Identify which of the three product cost definitions best fits the following situations (justify your choice):

- a. Setting the price for a new product
- b. Valuation of finished goods inventories for external reporting
- c. Determining whether to add a complementary product to the product line
- d. Choosing among competing product designs
- e. Calculating cost of goods sold for external reporting
- f. Deciding whether to increase the price of an existing product
- g. Deciding whether to accept or reject a special order, where the price offered is lower than the normal selling price
- h. Determining which of several potential new products should be developed, produced, and sold
- i. Deciding whether to produce and sell a product whose design and development costs were higher than budgeted

2-5 COST DEFINITIONS

LO4 Cardinal Company's southeastern factory provided the following information for the last calendar year:

Beginning inventory:	
Direct materials	\$49,300
Work in process	55,400
Ending inventories:	
Direct materials	\$20,000
Work in process	20,400

During the year, direct materials purchases amounted to \$150,000, direct labor cost was \$200,000, and overhead cost was \$324,700. There were 100,000 units produced.

Required:

1. Calculate the total cost of direct materials used in production.
2. Calculate the cost of goods manufactured. Calculate the unit manufacturing cost.
3. Of the unit manufacturing cost calculated in Requirement 2, \$1.70 is direct materials and \$3.24 is overhead. What is the prime cost per unit? Conversion cost per unit?

2-6 COST DEFINITIONS AND CALCULATIONS

LO4 For each of the following independent situations, calculate the missing values:

1. The Chico plant purchased \$275,000 of direct materials during May. Beginning direct materials inventory was \$16,000, and direct materials used in production were \$200,000. What is ending direct materials inventory?
2. Landsman Company produced 10,000 units at an average cost of \$6 each. The beginning inventory of finished goods was \$3,510. (The average unit cost was \$5.85.) Landsman sold 8,900 units. How many units remain in ending finished goods inventory?

- Beginning WIP was \$50,000, and ending WIP was \$18,750. If total manufacturing costs were \$93,000, what was the cost of goods manufactured?
- If the conversion cost is \$32 per unit, the prime cost is \$19.50, and the manufacturing cost per unit is \$39.50, what is the direct materials cost per unit?
- Total manufacturing costs for April were \$156,900. Prime cost was \$90,000, and beginning WIP was \$60,000. The cost of goods manufactured was \$125,000. Calculate the cost of overhead for April and the cost of ending WIP.

2-7 COST OF GOODS MANUFACTURED AND SOLD

LO4 Cimino Company manufactures staplers. At the beginning of June, the following information was supplied by its accountant:



Direct materials inventory	\$51,200
Work-in-process inventory	10,000
Finished goods inventory	10,075

During June, direct labor cost was \$22,000, direct materials purchases were \$70,000, and the total overhead cost was \$216,850. The inventories at the end of June were:

Direct materials inventory	\$18,600
Work-in-process inventory	6,050
Finished goods inventory	8,475

Required:

- Prepare a cost of goods manufactured statement for June.
- Prepare a cost of goods sold schedule for June.

2-8 PRIME COST, CONVERSION COST, PREPARATION OF INCOME STATEMENT: MANUFACTURING FIRM

LO3, LO4 Photo-Dive, Inc., manufactures disposable underwater cameras. During the last calendar year, a total of 150,000 cameras were made, and 154,000 were sold for \$8.00 each. The actual unit cost per camera is as follows:



Direct materials	\$2.25
Direct labor	1.50
Variable overhead	0.65
Fixed overhead	<u>0.70</u>
Total unit cost	<u>\$5.10</u>

The selling expenses consisted of a commission of \$0.25 per unit sold and advertising co-payments totaling \$36,000. Administrative expenses, all fixed, equaled \$83,000. There were no beginning and ending work-in-process inventories. Beginning finished goods inventory was \$30,600 for 6,000 cameras.

Required:

- Calculate the number of cameras and the value of ending finished goods inventory.
- Prepare a cost of goods sold statement.
- Prepare an absorption-costing income statement.

2-9 COST OF GOODS MANUFACTURED AND SOLD

LO4



Araj Company, a manufacturing firm, has supplied the following information from its accounting records for the last calendar year:

Direct labor cost	\$371,500
Purchases of direct materials	160,400
Freight-in on materials	1,000
Factory supplies used	37,800
Factory utilities	46,000
Commissions paid	80,000
Factory supervision and indirect labor	190,000
Advertising	23,900
Materials handling	26,750
Work-in-process inventory, January 1	201,000
Work-in-process inventory, December 31	98,000
Direct materials inventory, January 1	47,000
Direct materials inventory, December 31	17,000
Finished goods inventory, January 1	8,000
Finished goods inventory, December 31	62,700

Required:

1. Prepare a cost of goods manufactured statement.
2. Prepare a cost of goods sold statement.

2-10 INCOME STATEMENT, COST CONCEPTS, SERVICE COMPANY

LO3, LO4

Marcus Washington owns and operates three Compufix shops in the Chicago area. Compufix repairs and upgrades computers on site. In May, purchases of materials equaled \$9,350, the beginning inventory of materials was \$1,050, and the ending inventory of materials was \$750. Payments for direct labor during the month totaled \$18,570. Overhead incurred was \$15,000. The Chicago shops also spent \$5,000 on advertising during the month. Administrative costs (primarily accounting and legal services) amounted to \$3,000 for the month. Revenues for May were \$60,400.

Required:

1. What was the cost of materials used for repair and upgrade services during May?
2. What was the prime cost for May?
3. What was the conversion cost for May?
4. What was the total cost of services for May?
5. Prepare an income statement for May.

2-11 PRODUCT COST DEFINITIONS, VALUE CHAIN

LO1

Millennium Pharmaceuticals, Inc. (MPI), designs and manufactures a variety of drugs. One new drug, glaxane, has been in development for seven years. FDA approval has just been received, and MPI is ready to begin production and sales.

Required:

Refer to Exhibit 2-6. Which costs in the value chain would be considered by each of the following managers in their decision regarding glaxane?

1. Shelly Roberts is plant manager of the New Bern, North Carolina, plant where glaxane will be produced. Shelly has been assured that glaxane capsules will use

- well-understood processes and not require additional training or capital investment.
- Leslie Bothan is vice president of marketing. Leslie's job involves pricing and selling glaxane. Because glaxane is the first drug in its "drug family" to be commercially produced, there is no experience with potential side effects. Extensive testing did not expose any real problems (aside from occasional heartburn and insomnia), but the company could not be sure that such side effects did not exist.
 - Dante Fiorello is chief of research and development. His charge is to ensure that all reasearch projects, taken as a whole, eventually produce drugs that can support the R&D labs. He is assessing the potential for further work on drugs in the glaxane family.

2-12 FUNCTIONAL-BASED VERSUS ACTIVITY-BASED COST MANAGEMENT SYSTEMS

LO5 Jazon Manufacturing produces two different models of cameras. One model has an automatic focus, whereas the other requires the user to determine the focus. The two products are produced in batches. Each time a batch is produced, the equipment must be configured (set up) for the specifications of the camera model being produced. The manual-focus camera requires more parts than the automatic-focus model. The manual-focus model is also more labor-intensive, requiring much more assembly time but less machine time. Although the manual model is more labor-intensive, the machine configuration required for this product is more complex, causing the manual model to consume more of the setup activity resources than the automatic camera. Many, but not all, of the parts for the two cameras are purchased from external suppliers. Because it has more parts, the manual model makes more demands on the purchasing and receiving activities than does the automatic camera. Jazon currently assigns only manufacturing costs to the two products. Overhead costs are collected in one plantwide pool and are assigned to the two products in proportion to the direct labor hours used by each product. All other costs are viewed as period costs.

Jazon budgets costs for all departments within the plant—both support departments like maintenance and purchasing and production departments like machining and assembly. Departmental managers are evaluated and rewarded on their ability to control costs. Individual managerial performance is assessed by comparing actual costs with budgeted costs.

Required:

- Is Jazon using a functional-based or an activity-based cost management system? Explain.
- Assume that you want to design a more accurate cost accounting system. What changes would you need to make? Be specific. Explain why the changes you make will improve the accuracy of cost assignments.
- What changes would need to be made to implement an activity-based operational control system? Explain why you believe the changes will offer improved control.

2-13 DIRECT MATERIALS COST, PRIME COST, CONVERSION COST, COST OF GOODS MANUFACTURED

LO3 Shellenberger Company provided the following information for last year:

Beginning inventory:	
Direct materials	\$41,600
Work in process	26,000
Finished goods	75,000

Ending inventories:

Direct materials	\$ 31,600
Work in process	51,000
Finished goods	140,000

During the year, direct materials purchases amounted to \$270,000, direct labor cost was \$320,000, and overhead cost was \$490,000. During the year, 25,000 units were completed.

Required:

1. Calculate the total cost of direct materials used in production.
2. Calculate the cost of goods manufactured. Calculate the unit manufacturing cost.
3. Of the unit manufacturing cost calculated in Requirement 2, \$11 is direct materials and \$12 is overhead. What is the prime cost per unit? Conversion cost per unit?

2-14 COST OF GOOD SOLD, INCOME STATEMENT

LO3, LO4 Refer to **Exercise 2-13**. Last year, Shellenberger recognized revenue of \$1,380,000 and had selling and administrative expense of \$216,300.

Required:

1. What is the cost of goods sold for last year?
2. Prepare an income statement for Shellenberger for last year.

PROBLEMS

2-15 COST INFORMATION AND DECISION MAKING, RESOURCE AND ACTIVITY DRIVERS, ACTIVITY-BASED VERSUS FUNCTIONAL-BASED SYSTEMS

LO5 Wright Plastic Products is a small company that specialized in the production of plastic dinner plates until several years ago. Although profits for the company had been good, they have been declining in recent years because of increased competition. Many competitors offer a full range of plastic products, and management felt that this created a competitive disadvantage. The output of the company's plants was exclusively devoted to plastic dinner plates. Three years ago, management made a decision to add additional product lines. They determined that existing idle capacity in each plant could easily be adapted to produce other plastic products. Each plant would produce one additional product line. For example, the Atlanta plant would add a line of plastic cups. Moreover, the variable cost of producing a package of cups (one dozen) was virtually identical to that of a package of plastic plates. (Variable costs referred to here are those that change in total as the units produced change. The costs include direct materials, direct labor, and unit-based variable overhead such as power and other machine costs.) Since the fixed expenses would not change, the new product was forecast to increase profits significantly (for the Atlanta plant).

Two years after the addition of the new product line, the profits of the Atlanta plant (as well as other plants) had not improved—in fact, they had dropped. Upon investigation, the president of the company discovered that profits had not increased as expected because the so-called fixed cost pool had increased dramatically. The president

interviewed the manager of each support department at the Atlanta plant. Typical responses from four of those managers are given next.

Materials Handling: The additional batches caused by the cups increased the demand for materials handling. We had to add one forklift and hire additional materials handling labor.

Inspection: Inspecting cups is more complicated than plastic plates. We only inspect a sample drawn from every batch, but you need to understand that the number of batches has increased with this new product line. We had to hire more inspection labor.

Purchasing: The new line increased the number of purchase orders. We had to use more resources to handle this increased volume.

Accounting: There were more transactions to process than before. We had to increase our staff.

Required:

1. Explain why the results of adding the new product line were not accurately projected.
2. Could this problem have been avoided with an activity-based cost management system? If so, would you recommend that the company adopt this type of system? Explain and discuss the differences between an activity-based cost management system and a functional-based cost management system.

2-16 SYSTEMS CONCEPTS, FUNCTIONAL-BASED VERSUS ACTIVITY-BASED COST ACCOUNTING SYSTEMS

LO1, LO5 The following items are associated with a functional-based cost accounting information system, an activity-based cost accounting information system, or both (that is, some elements are common to the two systems):

- a. Usage of direct materials
- b. Direct materials cost assigned to products using direct tracing
- c. Direct labor cost incurrence
- d. Direct labor cost assigned to products using direct tracing
- e. Setup cost incurrence
- f. Setup cost assigned using number of setups as the activity driver
- g. Setup cost assigned using direct labor hours as the activity driver
- h. Cost accounting personnel
- i. Submission of a bid, using product cost plus 25 percent
- j. Purchasing cost incurrence
- k. Purchasing cost assigned to products using direct labor hours as the activity driver
- l. Purchasing cost assigned to products using number of orders as the activity driver
- m. Materials handling cost incurrence
- n. Materials handling cost assigned using the number of moves as the activity driver
- o. Materials handling cost assigned using direct labor hours as the activity driver
- p. Computer
- q. Costing out of products
- r. Decision to continue making a part rather than buying it
- s. Printer
- t. Customer service cost incurred
- u. Customer service cost assigned to products using number of complaints as the activity driver
- v. Report detailing individual product costs
- w. Commission cost

- x. Commission cost assigned to products using units sold as the activity driver
- y. Plant depreciation
- z. Plant depreciation assigned to products using direct labor hours

Required:

1. For each cost system, classify the items into one of the following categories:
 - a. Interrelated parts
 - b. Processes
 - c. Objectives
 - d. Inputs
 - e. Outputs
 - f. User actions
2. Explain the choices that differ between the two systems. Which system will provide the best support for the user actions? Explain.
3. Draw an operational model that illustrates each cost accounting system—with the items that belong to the system used as examples for each component of the model.
4. Based on the operational models, comment on the relative costs and benefits of the two systems. Which system should be chosen?

2-17 ACTIVITY-BASED VERSUS FUNCTIONAL-BASED OPERATIONAL CONTROL SYSTEMS

LO1, LO5 The actions listed next are associated with either an activity-based operational control system or a functional-based operational control system:

- a. Budgeted costs for the maintenance department are compared with the actual costs of the maintenance department.
- b. The maintenance department manager receives a bonus for “beating” budget.
- c. The costs of resources are traced to activities and then to products.
- d. The purchasing department is set up as a responsibility center.
- e. Activities are identified and listed.
- f. Activities are categorized as adding or not adding value to the organization.
- g. A standard for a product’s material usage cost is set and compared against the product’s actual materials usage cost.
- h. The cost of performing an activity is tracked over time.
- i. The distance between moves is identified as the cause of materials handling cost.
- j. A purchasing agent is rewarded for buying parts below the standard price set by the company.
- k. The cost of the materials handling activity is reduced dramatically by redesigning the plant layout.
- l. An investigation is undertaken to find out why the actual labor cost for the production of 1,000 units is greater than the labor standard allowed.
- m. The percentage of defective units is calculated and tracked over time.
- n. Engineering has been given the charge to find a way to reduce setup time by 75 percent.
- o. The manager of the receiving department lays off two receiving clerks so that the fourth-quarter budget can be met.

Required:

Classify the preceding actions as belonging to either an activity-based operational control system or a functional-based control system. Explain why you classified each action as you did.

2-18 INCOME STATEMENT, COST OF GOODS MANUFACTURED

LO3, LO4



Dalal Company produced 150,000 floor lamps during the past calendar year. These lamps sell for \$50 each. Dalal had 2,500 floor lamps in finished goods inventory at the beginning of the year. At the end of the year, there were 11,500 floor lamps in finished goods inventory. Dalal's accounting records provide the following information:

Purchases of direct materials	\$1,550,000
Direct materials inventory, January 1	290,000
Direct materials inventory, December 31	112,000
Direct labor	2,000,000
Indirect labor	790,000
Depreciation, factory building	1,100,000
Depreciation, factory equipment	630,000
Property taxes on the factory	65,000
Utilities, factory	150,000
Insurance on the factory	200,000
Salary, sales supervisor	85,000
Commissions, salespersons	490,000
General administration	390,000
Work-in-process inventory, January 1	450,000
Work-in-process inventory, December 31	750,000
Finished goods inventory, January 1	107,500
Finished goods inventory, December 31	489,000

Required:

1. Prepare a cost of goods manufactured statement.
2. Compute the cost of producing one floor lamp last year.
3. Prepare an income statement on an absorption-costing basis.

2-19 COST OF GOODS MANUFACTURED, COST IDENTIFICATION, SOLVING FOR UNKNOWNNS

LO2, LO4

CPA-Skilz Company creates, produces, and sells CD-ROM-based CPA review courses for individual use. Susan Wayans, head of human resources, is convinced that question development employees must have strong analytical and problem-solving skills. She asked Jeremy Slater, controller for CPA-Skilz, to help develop problems to help screen applicants before they are interviewed. One of the problems Jeremy developed is based on the following data for a mythical company for the previous year:

- a. Conversion cost was \$360,000 and was four times the prime cost.
- b. Direct materials used in production equaled \$75,000.
- c. Cost of goods manufactured was \$415,000.
- d. Beginning work in process is one-half the cost of ending work in process.
- e. There are no beginning or ending inventories for direct materials.
- f. Cost of goods sold was 80 percent of cost of goods manufactured.
- g. Beginning finished goods inventory was \$14,400.

Required:

1. Calculate the cost of goods manufactured for the previous year.
2. Calculate the cost of goods sold for the previous year.

2-20 INCOME STATEMENT, COST OF SERVICES PROVIDED, SERVICE ATTRIBUTES

LO3, LO4 Young, Andersen, and Touche (YAT) is a tax services firm. The firm is located in San Diego and employs 10 professionals and eight staff. The firm does tax work for small businesses and well-to-do individuals. The following data are provided for the last fiscal year. (The Young, Andersen, and Touche fiscal year runs from July 1 through June 30.)

Returns processed	2,000
Returns in process, beginning of year	\$ 78,000
Returns in process, end of year	134,000
Cost of services sold	890,000
Beginning direct materials inventory	20,000
Purchases, direct materials	40,000
Direct labor	800,000
Overhead	100,000
Administrative	57,000
Selling	65,000

Required:

1. Prepare a statement of cost of services sold.
2. Refer to the statement prepared in Requirement 1. What is the dominant cost? Will this always be true of service organizations? If not, provide an example of an exception.
3. Assuming that the average fee for processing a return is \$700, prepare an income statement for Young, Andersen, and Touche.
4. Discuss three differences between services and tangible products. Calculate the average cost of preparing a tax return for last year. How do the differences between services and tangible products affect the ability of YAT to use the last year's average cost of preparing a tax return in budgeting the cost of tax return services to be offered next year?

2-21 COST OF GOODS MANUFACTURED, INCOME STATEMENT

LO3, LO4 Jordan Company produces a chemical reagent used by medical laboratories. For 2007, Jordan reported the following:

Work-in-process inventory, January 1	\$ 13,250
Work-in-process inventory, December 31	13,250
Finished goods inventory, January 1 (24,000 units)	170,000
Finished goods inventory, December 31 (12,000 units)	85,000
Direct materials inventory, January 1	15,600
Direct materials inventory, December 31	14,000
Direct materials used	120,000
Direct labor	72,000
Plant depreciation	9,500
Salary, production supervisor	45,000
Indirect labor	36,000
Utilities, factory	5,700
Sales commissions	66,000
Salary, sales supervisor	40,000

(continued)

Depreciation, factory equipment	\$25,000
Administrative expenses	52,000
Supplies (half used in the factory, half used in the sales office)	4,000

Jordan produced 100,000 units during 2007 and sold 127,000 units at \$6 per unit.

Required:

1. Prepare a statement of cost of goods manufactured.
2. Prepare an absorption-costing income statement.

2-22 COLLABORATIVE LEARNING EXERCISE

LO2, LO4,
LO5

Divide the class into groups of four or five students. Each group should have one piece of paper and a pen or pencil. The paper and pencil pass clockwise around the group, giving each student a chance to write down his/her response to the following exercise. As the student writes the response, he/she should say the response aloud to the group. (This both involves the group and alerts the remaining members that the response has already been considered.) After five to 10 minutes, have a representative from each group read their group's responses aloud to the class.

List as many interrelated parts, processes, and objectives of an accounting information system as possible.

2-23 CYBER RESEARCH CASE

LO2

On the Internet, access the homepages of several enterprise resource planning (ERP) vendors (e.g., <http://www.baan.com>; <http://www.cai.com>; <http://www.jdedwards.com>; <http://www.oracle.com>; <http://www.peoplesoft.com>; <http://www.sap.com>). What are the advantages touted by each? Does there appear to be any difference between the companies? Write a memo from the CFO (chief financial officer) of a medium-sized manufacturing company to the CEO (chief executive officer) recommending the installation of an ERP system, discussing the differences and similarities among the ERP vendors.