

Chapter 3

Cost Flows and Cost Terminology

TOM AND LYNDA APPRECIATE THE help you have given them in structuring their decision problem. They now want you to help them figure out the profit they could expect to make from offering a yoga class. Naturally, you turn to Hercules' accounting system for revenue and cost data. To estimate the change in profit from offering yoga you need to understand how Hercules' accounting system works. More generally, knowing how firms track revenues and costs enables you to tailor data from the accounting system to the decision problem at hand.

APPLYING THE DECISION FRAMEWORK

- | | |
|---|---|
| What Is the Problem? | What data should you use to estimate the profit impact of offering yoga? |
| What Are the Options? | You naturally turn to the accounting system to obtain cost and revenue data. Your options relate to whether and how to modify Hercules' system to suit your needs. |
| What Are the Costs and Benefits? | Modifying the system is costly in terms of time, effort, and the expertise required. However, it can lead to benefits in terms of a more accurate profit estimate. |
| Make the Decision! | Your decision hinges on the benefits of obtaining a more accurate estimate versus the costs of obtaining this estimate. As the stakes increase, firms are more likely to modify their systems to facilitate internal decisions. |



Andrea Wyner/Getty Images

Tom and Lynda rely on their accounting system to help them figure out the profit from offering a yoga class.

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

- 1 Distinguish product costs from period costs.
- 2 Understand the flow of costs in service firms.
- 3 Discuss how inventories affect the flow of costs in merchandising firms.
- 4 Explain the cost terminology and the flow of costs in manufacturing firms.
- 5 Allocate overhead costs to products.

In this chapter, we discuss the kinds of accounting systems you will encounter in the workplace. Most firms design their financial records to track costs by business function, such as whether they relate to manufacturing, selling, or administration. Why? Because formal accounting systems typically are set up to help with financial reporting, and Generally Accepted Accounting Principles (GAAP) requires financial reports to group costs by business function.

We begin this chapter with a short look at how firms accumulate costs for financial reporting purposes. We then examine cost accumulation in three types of organizations: service, merchandising, and manufacturing. We discuss the similarities and differences in the flow of costs in these organizations, focusing particularly on how they accumulate costs for valuing inventory and reporting income. Because cost allocations play an integral role in this process, we end with a brief overview of the mechanics of cost allocations.



CHAPTER CONNECTIONS

An organization's accounting information system provides considerable detail regarding its activities. As you learned in Chapter 1, decision makers aggregate and analyze these detailed data for different purposes. In many cases, data in financial accounting reports are not directly useful for internal decision making because these reports aggregate costs and benefits by business function. For any given decision, GAAP statements combine controllable costs and benefits with noncontrollable costs and benefits and fixed costs with variable costs. This feature means that decision makers must modify financial data to suit their needs. In Chapter 4, we will show you how to construct accounting reports that group costs by their variability. This is a first step in modifying GAAP statements to obtain controllable costs and benefits.

Product and Period Costs

LEARNING OBJECTIVE 1

Distinguish product costs from period costs.

In Chapter 1, you learned that one important function of accounting is to provide data for the preparation of financial statements such as the income statement, balance sheet, and statement of cash flows. These statements convey information about the performance and value of a firm to its shareholders, lenders, banks, and the government. You also learned that these statements must conform to GAAP and the reporting standards put out by the **Financial Accounting Standards Board**.

Exhibit 3.1 displays Hercules' GAAP income statement for the most recent month. This income statement informs us that Tom and Lynda made \$10,000 last month. Hercules generated revenues of \$80,000 and, by adding up the two reported costs, spent \$70,000. Why does Hercules report costs in two separate lines? The answer is that, to comply with GAAP, Hercules' income statement must separate *product costs* from *period costs*. Let us examine this distinction.

In the line below revenues, Hercules reports that it incurred costs of \$55,000 for providing programs and services. These costs directly relate to Hercules' primary business function. They include items such as instructor salaries, depreciation of



Product costs at a gym include the cost of equipment used by members. (Michael Grecco/Getty Images)

Exhibit 3.1

Hercules Health Club: GAAP Income Statement for the Most Recent Month

Revenues	\$80,000
Costs of providing programs and services	55,000
Gross margin	25,000
Management salaries, marketing, and administration	15,000
Profit before Taxes	\$10,000

equipment, utility costs in the gymnasium, equipment maintenance, and supplies. In financial accounting terms, the costs associated with getting products and services ready for sale are **product costs**.

Product costs always appear “above the line” for **gross margin**, which is revenues less product costs. Hercules’ gross margin of \$25,000 equals its revenues of \$80,000 less its product costs of \$55,000.

In the line below gross margin, Hercules reports that it spent \$15,000 on costs related to management salaries, marketing, and administration. These costs, which are not a part of the costs of providing programs and services, are period costs. **Period costs** do not directly relate to readying products or services for sale. Rather, these costs, which include office rent, advertising, customer service, and sales force compensation, relate more to the passage of time. Period costs, *which are all costs that are not product costs*, always appear “below the line” for gross margin. We subtract period costs from the gross margin to arrive at profit before taxes.

The matching principle in GAAP is the answer for why we need to separate product and period costs. GAAP requires that we match the revenues and costs associated with making and selling a product or service during the same accounting period. We flow product costs through inventory accounts to enable such matching. There is no need to match period costs, as they are not associated with making and selling a product or service. Thus, we immediately expense, or charge to the income statement, all of our period costs.

GAAP provides considerable flexibility regarding reporting formats. Many firms follow a multistep presentation of income statements and separately report product and period costs. However, it is easy to find firms that employ single-step reporting. In their detailed records, these firms also distinguish between product and period costs for costing purposes. However, their income statements may not show a line for gross margin nor do they report the costs separately. Throughout this text, we will use the two-step presentation to emphasize the distinction between product and period costs. Moreover, GAAP relies on managerial judgment in determining cost categories because most firms incur at least some costs not readily classified as product or period costs.

Although these costs exist in all organizations, their nature, the kinds of systems used to accumulate them, and the complexity of the calculations all depend on the type of organization. In the following sections, we discuss cost accumulation procedures in the three main types of organizations—service firms, merchandising firms, and manufacturing firms.

Cost Flows in Service Organizations

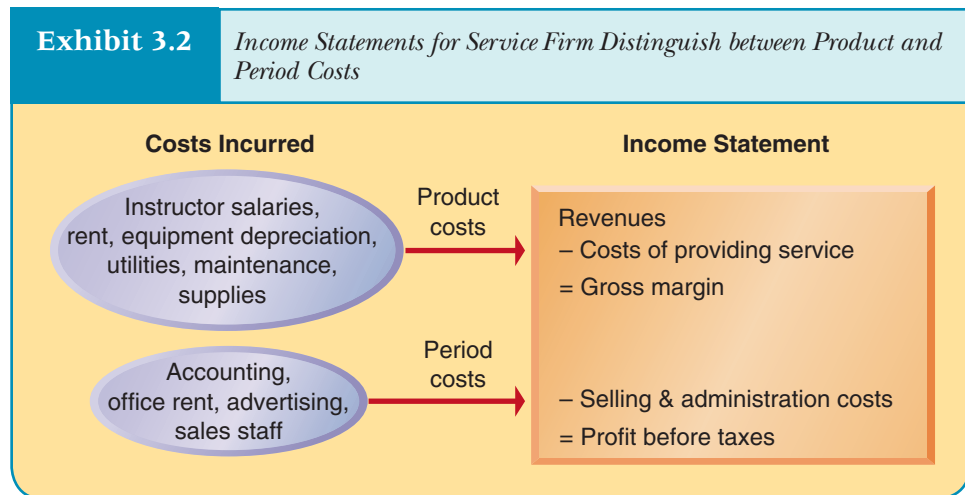
Consulting firms such as **Accenture**, hoteliers such as **Marriott**, and airlines such as **JetBlue** are service firms. What distinguishes service firms from other firms? Like all organizations, these firms use a mix of human and capital resources to perform their functions. However, unlike merchandising and manufacturing firms, the products **service firms** offer are not tangible or storable. For example, we enjoy the hotel experience when we are at **Marriott**, but we cannot store the experience for a later period. In essence, service firms make their facilities available to others for a fee—**Accenture**, **Marriott**, and **JetBlue** “rent” their consultants, rooms, and planes, respectively.

Hercules is a service firm, making its facilities available to members for a fee. Exhibit 3.2 illustrates the cost flows in Hercules and distinguishes product costs from period costs.

Now, let us turn to Tom and Lynda’s yoga decision. Does Hercules’ GAAP income statement in Exhibit 3.1 provide enough information to make this decision? The

LEARNING OBJECTIVE 2

Understand the flow of costs in service firms.



answer is “no.” Tom and Lynda rely on their business experience, not GAAP financial statements, to estimate the number of additional members the gym could attract by offering yoga. Furthermore, GAAP statements provide limited information about opportunity costs. For example, offering yoga might prevent Hercules from offering a new karate class. Yet we cannot determine from GAAP reports the possible profit from offering karate. For such reasons, it frequently is vital to modify accounting reports and use nonfinancial data to estimate the controllable costs and benefits of a decision option.

Although the GAAP income statement separates product costs from period costs, it combines controllable costs with noncontrollable costs and fixed costs with variable costs. For example, the cost of providing services includes the depreciation on exercise equipment as well as the cost of supplies. The cost of supplies, which is variable, will increase if the yoga class attracts new members. However, the amount of equipment depreciation will not change if Hercules offers yoga. Similarly, period costs contain both controllable and noncontrollable costs. For example, offering yoga will change administrative expenses such as fees Hercules pays to banks for processing credit card transactions but not the salary paid to office staff. As such, simply dividing total product or period cost by the number of members would yield a poor estimate of the cost per member associated with offering yoga.

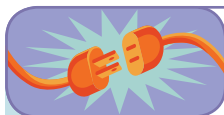
In Chapter 4, we learn some techniques for modifying GAAP statements to estimate the controllable costs of a decision. For now, let us expand our discussion about the flow of costs to merchandising firms. Unlike service firms, inventories play a vital role in merchandising firms because a retailer’s products are both tangible and storable. The presence of inventory adds some complexity to the accounting system; we explore this issue next. Later in the chapter, we will also address the role of inventories for manufacturing firms.

Cost Flows in Merchandising Organizations

LEARNING OBJECTIVE 3

Discuss how inventories affect the flow of costs in merchandising firms.

Examples of merchandising firms include retailers such as **JCPenney** and **Sears**, grocery stores such as **Kroger**, and office products stores such as **Office Depot** and **Staples**. **Merchandising firms** buy goods from suppliers and resell substantially the same products to customers. Unlike service firms, merchandising firms maintain an inventory of goods that they buy and sell. They use this inventory to make



Connecting to Practice

BLURRED BOUNDARIES

It is sometimes difficult to determine whether a firm is a service, merchandising, or manufacturing firm. For example, is **Kinko's** a service firm? Its final product, copies, is both storable and tangible to consumers, but the firm itself does not maintain any inventories of its final product. And is **Bank of America** a service firm? When we cash a check, we receive money, which is both tangible and storable. On the other hand, banks provide financial advice and analysis to their customers.

COMMENTARY: As these examples illustrate, not all firms fall cleanly in the service, merchandising, and manufacturing distinctions. Some firms exhibit characteristics of each type, making them difficult to classify. However, regardless of their classification, all firms distinguish between product and period costs.

goods available in the quantities, varieties, and delivery schedules demanded by customers.

INVENTORY EQUATION

Because inventories are a necessary part of a merchandiser's business, such firms need to distinguish the cost of goods *purchased* from the cost of goods *sold*. For financial reporting purposes, firms expense the cost of items when they sell the items, not when they purchase them.

Suppose a merchandiser buys and stores some items in one month, expecting to sell them next month. The cost of this merchandise, or goods, flows through the inventory account, becoming part of **cost of goods sold** only when the firm sells the items. We capture this flow using the following inventory equation.

$$\begin{aligned}
 & \text{Cost of beginning inventory} \\
 & + \text{Cost of goods purchased during the period} \\
 & - \text{Cost of ending inventory} \\
 & = \text{Cost of goods sold (COGS) during the period}
 \end{aligned}$$

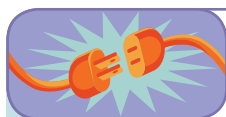
Applying this inventory equation in practice is not as simple as it appears. Retail firms often buy several batches of an item at different times and at different prices. Thus, at any given time, firms might have different "layers" of inventory of the same item. At the time of sale, it becomes necessary to determine which batch or layer the items belong to, in order to use the corresponding prices to compute the cost of sales. Firms achieve this by making inventory cost flow assumptions such as First-In-First-Out (FIFO) or Last-In-First-Out (LIFO). For simplicity, we use the FIFO method whenever we require an inventory cost flow assumption.



Check It! Exercise #1

For the month of June, you have the following data for Mega Mart, a merchandising firm: (1) cost of beginning inventory = \$3,450,200; (2) cost of ending inventory = \$3,745,600; (3) cost of goods purchased during June = \$24,795,740. Verify that the cost of goods sold for Mega Mart for June is \$24,500,340.

Solution at end of chapter.



Connecting to Practice

INVENTORIES IN SERVICE ORGANIZATIONS

NCS Pearson offers a wide range of testing and scoring services. Many states use its services to test and evaluate students and schools, particularly in connection with the federal No Child Left Behind Act. **NCS** often undertakes special projects for clients, with some projects lasting many years.

COMMENTARY: Some service firms, like **NCS**, report an inventory in their annual reports. Such an inventory consists of costs incurred on partially completed projects yet to be billed. **NCS** cannot expense these amounts if it has not recognized the associated revenue. The firm would expense the inventory when it bills the client per the terms of the project.

INCOME STATEMENT

Exhibit 3.3 depicts the typical flow of costs in a merchandising firm. Except for the presence of the inventory account, the cost flows in merchandising firms resemble the flows for service firms.

Exhibit 3.4 presents the most recent annual income statement for Office Gallery, a merchandising firm that sells three standard lines of office furniture: desks, chairs, and bookshelves.

As with Hercules, the two main cost categories are the costs incurred to obtain and prepare the goods for sale (product costs) and the costs associated with sales and administration (period costs).

The major item in the first group is the cost of purchasing goods from suppliers. This item includes not only the amounts paid to suppliers but also the cost of transportation and the cost of preparing the goods for sale. Office Gallery normally does not sell all of the furniture it purchases in a given month. Thus, it adds the cost of all purchases to its inventory account. As it sells items from its inventory, Office Gallery removes the associated costs from the inventory account and expenses them in the income statement. You can see this flow of costs in a condensed manner in Exhibit 3.4's income statement.

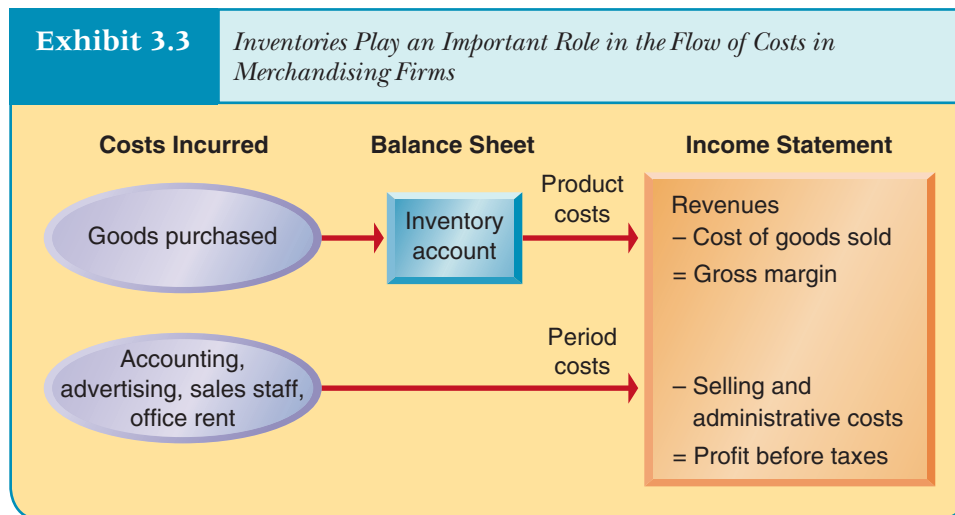


Exhibit 3.4 Office Gallery: GAAP Income Statement

		Total
Revenues		\$63,832,500
Beginning inventory	\$18,245,300	
= + Cost of goods purchased	45,283,550	
– Ending inventory	18,427,500	
Cost of goods sold		\$45,101,350
Gross margin		\$18,731,150
Administrative costs	\$5,491,840	
Sales salaries and commissions	4,750,300	
Marketing, advertising, and distribution	4,867,320	
Total S&A (period) costs		\$15,109,460
Profit before taxes		\$3,621,690

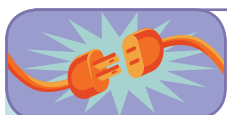
As with service firms, period costs appear below the line for gross margin. Office Gallery then computes profit before taxes as the gross margin less period costs. As we will see next, the cost flows are even more complex in manufacturing firms.

Cost Flows in Manufacturing Organizations

Unlike merchandising firms, **manufacturing firms** use labor and equipment to transform inputs such as raw materials and components into outputs. For instance, **Sony** purchases plasma screens, frames, and circuit boards from suppliers. It makes additional components itself using basic inputs. Employees at **Sony** then assemble these components into its award-winning televisions. Because **Sony** has inventories

LEARNING OBJECTIVE 4

Explain the cost terminology and the flow of costs in manufacturing firms.

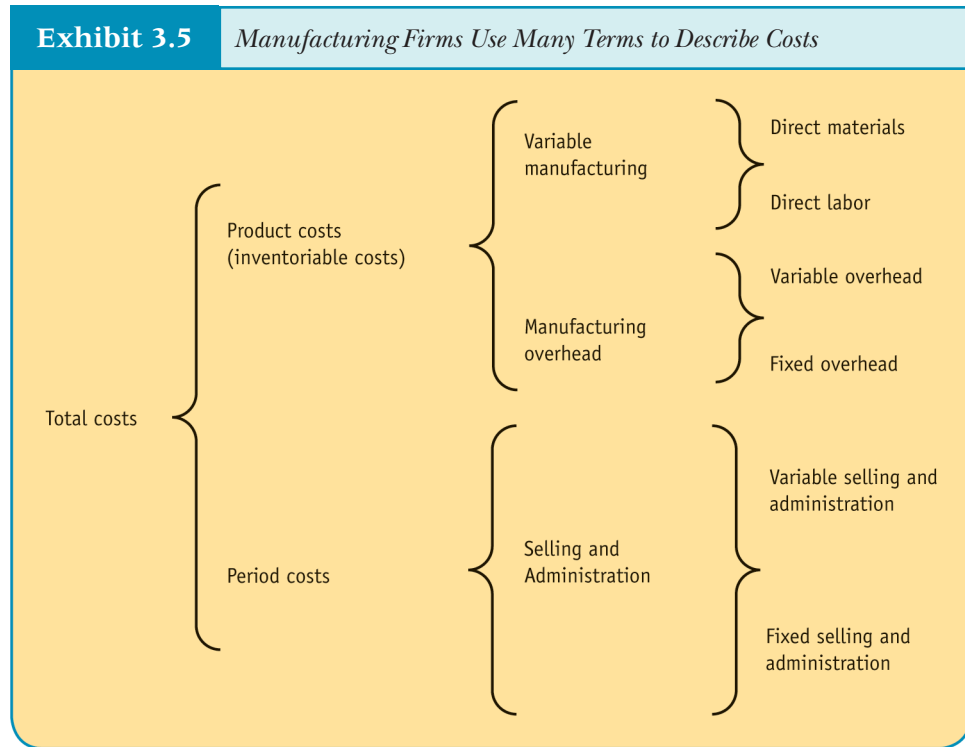


Connecting to Practice

MANAGING LOGISTICS

Merchandising operations range in size from your neighborhood mom-and-pop store to global behemoths such as **Wal-Mart**. Nevertheless, all successful merchandisers share two key traits: efficiently managed inventory and a strong focus on reducing support costs. The business discipline of “supply chain management” is concerned with helping the firm have the right product at the right place at the right time and for the right price!

COMMENTARY: Supply chains today span the globe. Seeing a Chinese-made product at your local store would not surprise you in the least. The rise of global supply chains allows merchandisers to offer increasing product variety at ever-lower prices. However, global sourcing also is a major headache because the firm now needs to manage more suppliers in foreign locales. Entire industries have sprung up to help firms deal with this problem in their quest to achieve operational excellence.



of raw materials and components, partly finished items, and finished goods, its flow of costs is more complex than that for a typical service or merchandising firm.

The many kinds of costs and variations in manufacturing production processes result in a dizzying array of cost terms. Exhibit 3.5 summarizes the most important of these terms commonly found in practice.

COST TERMINOLOGY

We've already shown that total costs are the sum of product costs and period costs. Let's first look further at product costs, which, as you know, are the costs of manufacturing the products. Typical inputs in a manufacturing firm include *materials*, such as steel, leather, canvas, and plastic, and *labor*, the physical work required to convert materials to a finished product. These items represent variable manufacturing costs as expenditures on these items vary proportionally with production volume. Moreover, because firms frequently can trace materials and labor costs directly to products, they are direct costs. As such, many refer to materials and labor costs as **direct materials** and **direct labor**, respectively.

In addition to materials and labor, manufacturers use other inputs—including factories, equipment, machines, and production support staff—to make their product. The costs of these resources represent indirect costs because many products share these resources; we cannot trace these costs directly to a specific product. We refer to the total of all these indirect manufacturing inputs as **overhead**, or sometimes as **manufacturing overhead**.

Some overhead costs, such as the costs of supplies and packaging materials, might vary with production volume. In contrast, the costs of other overhead resources, such as factory rent and equipment depreciation, are fixed. For example, automobile manufacturers such as **Suzuki** and **Ford** might classify the

cost of power needed to operate an assembly line as a variable indirect cost, and the cost of a salaried production supervisor as fixed and indirect. We refer to the variable portion of these costs as **variable overhead** and the fixed portion as **fixed overhead**.

Direct materials, direct labor, and overhead (both variable and fixed) are all product costs because they are connected with getting the product ready for sale. Some firms emphasize this definition by referring to product costs as **inventoriable costs**, for these are the costs that firms attach to inventories of work in process and finished goods.

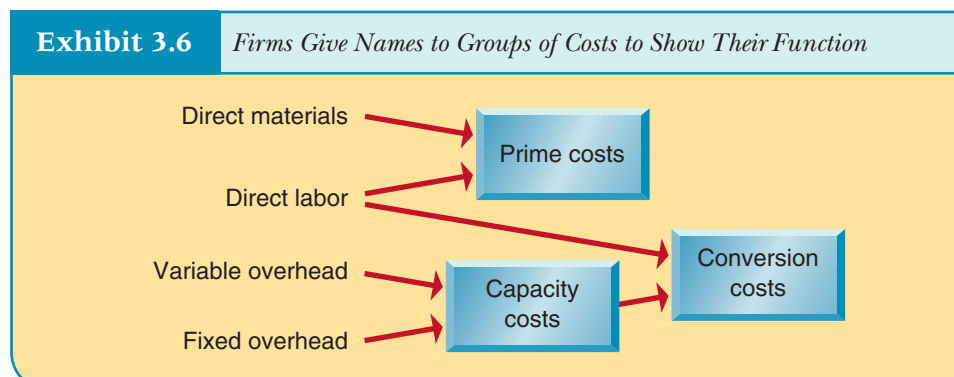
Of course, manufacturing firms also incur nonproduction related costs. Some of these costs, such as the cost of transporting goods to customers and sales commissions, are variable. Other costs, such as rentals for sales offices and salaries to marketing personnel, are fixed. Firms also incur administration costs associated with managing the organization itself. Such costs include management salaries, the cost of maintaining a legal staff, accounting and payroll costs, and other corporate level expenses. Collectively, we refer to these costs as **selling and administration costs**. From a financial reporting perspective, selling and administration costs are period costs. GAAP prohibits firms from attaching these costs to inventories. Consequently, firms expense these costs in the income statement during the period they are incurred.

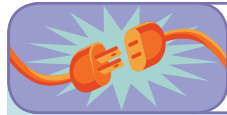
Exhibit 3.6 introduces some additional terminology that firms use to refer to groups of costs. Manufacturers such as **Timken** refer to the sum of materials and labor costs as **prime costs** because these are the primary inputs into the manufacturing process. Likewise, firms refer to the sum of their variable and fixed overhead as **capacity costs** because these indirect costs provide the firm with the ability they need to make their products. Finally, firms such as Monsanto refer to the sum of labor and overhead as **conversion costs**; these expenditures are required to convert their raw materials to finished goods.

TYPICAL PRODUCTION PROCESS

Now that you understand the cost terminology used in manufacturing firms, let us turn to how their accounting systems accumulate and report these costs. We begin by examining the physical flow of resources in a manufacturing firm. This is a useful step because accounting flows mirror this physical flow.

Exhibit 3.7 illustrates a typical production process. When firms purchase raw materials, they add the cost to the materials inventory account. Firms accumulate labor and overhead costs incurred during a given accounting period in temporary “control” accounts, which are zeroed out at the end of each accounting period.





Connecting to Practice

HOW MUCH DOES THAT WII COST?

Teardown analysis includes disassembling a product to determine its components. The sum of the costs of individual components provides a good estimate the cost of direct materials, and thus the manufacturer's margin. Such analysis yields the following estimates for some popular products (data as of January 2007):

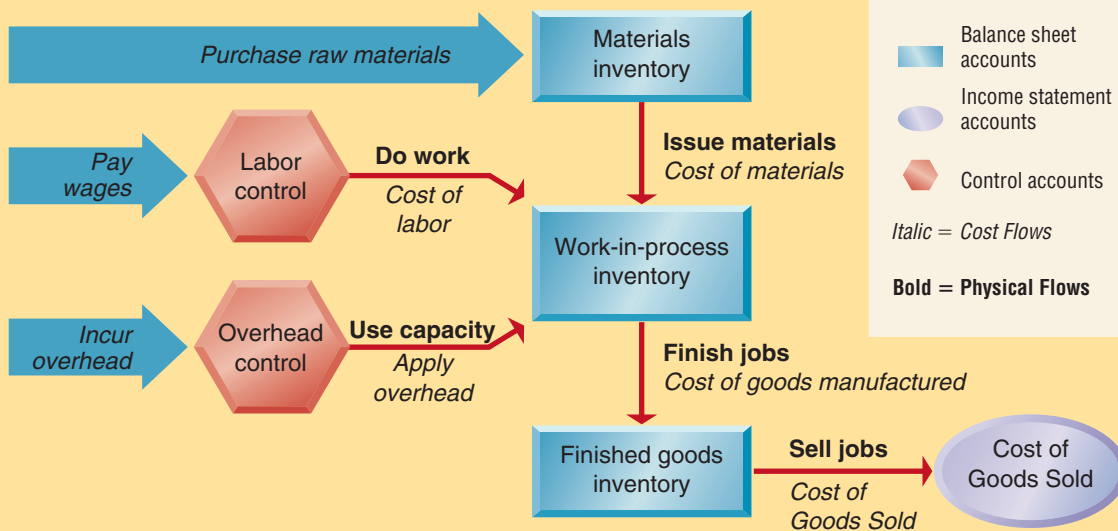
Product (firm)	Price	Teardown Cost	Items included
Wii (Nintendo)	\$ 199 (wholesale)	\$ 158.95	Materials only
30 GB Ipod (Apple)	\$ 249 (retail)	\$ 130.90	Materials only
Q phone (Motorola)	\$ 199 (discounted)	\$ 158.00	Materials & assembly
iPhone (Apple)	\$ 499 (retail)	\$ 229.85	Manufacturing cost
HD-DVD (Toshiba)	\$ 499	\$ 674.00	Materials only

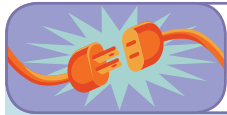


The product cost for a Wii includes the cost of materials, labor, and manufacturing overhead. (Reuters/Yuriko Nakao/Landov LLC)

COMMENTARY: Firms guard their cost data well because knowledge of this information helps the competition. Unlike Apple, which makes a substantive margin on its products, the estimate for Wii shows that Nintendo likely experiences a loss from the sale of the Wii. This fact is not surprising because firms that sell game systems make most of their profit from selling games and not the consoles themselves. In the same way, Verizon (which buys the Q from Motorola) likely sells the Q below cost, hoping to make money from wireless services. Likewise, by pricing the DVD player aggressively, Toshiba hopes to increase market share for its video format and ensure its long-run viability.

Exhibit 3.7 Physical and Cost Flows in Manufacturing





Connecting to Practice

MANUFACTURING PROCESSES

Firms vary greatly in their raw materials and production processes. Firms such as **Alcoa** convert bauxite ore into aluminum. Other manufacturers such as **Caterpillar** use steel, aluminum, and plastic to make components and then assemble these components into construction equipment. Construction firms such as **Toll Brothers** use Caterpillar's products to build new homes.

COMMENTARY: As seen above, the types of input materials used as well as the production processes and the products vary widely across manufacturers. This variety has led to a considerable range of manufacturing practices, including Just-in-Time production and lean manufacturing.

As production commences, firms assign the cost of materials, labor, and overhead from the respective inventory and control accounts to a *work-in-process* (WIP) account. The sum of materials, labor, and overhead costs added to the work-in-process account during the period are the total manufacturing costs charged to production.

Often, the production process consists of many steps, with new materials and/or labor added at each step. Each step also consumes some overhead resources. Cost assignments mirror this physical flow. At every step, we add the costs of materials, labor, and overhead consumed in that step to the WIP account to “build” the cost of the work performed on a specific product.

Once the production process is completed, firms transfer finished work physically from work-in-process inventory to *finished goods* (FG) inventory. Correspondingly, they transfer the **cost of goods manufactured** (COGM) from the work-in-process inventory account to the finished goods inventory account.

When firms sell finished goods, they physically transfer the goods to buyers. At the same time, firms remove the associated cost from the FG inventory account and transfer it to the cost of goods sold (COGS) account. Cost of goods sold appears as a deduction from revenues in the income statement, with gross margin equaling the difference between revenues and COGS.

INCOME STATEMENT

Using an example, Vulcan Forge, let us take a closer look at the cost flows for a manufacturing company.

Vulcan Forge owns and operates a plant that makes a single product: 5-ton hooks used in cranes. Vulcan buys raw materials such as steel and converts them into hooks. Following the flow in Exhibit 3.7, let us begin with raw materials. Exhibit 3.8 presents the raw materials inventory account.

The work-in-process account, shown in Exhibit 3.9, informs us that Vulcan began the year with \$2 million worth of work in process. To this amount, the firm added \$10 million of raw materials, as we learned from Exhibit 3.8. Vulcan also spent \$8 million on labor and \$16 million on manufacturing overhead during the year. We add these three amounts, which we collectively refer to as the **total manufacturing costs charged to production**, to the WIP account. As with raw materials, Vulcan applies the inventory equation to the WIP account to obtain cost of goods manufactured.

Exhibit 3.8 *Vulcan Forge: Cost of Raw Materials Used*

	Total
Beginning inventory of raw materials	\$1,500,000
+ Purchases of raw materials	9,000,000
– Ending inventory of raw materials	500,000
= Cost of materials used	<u>\$10,000,000</u>

Exhibit 3.9 *Vulcan Forge: Cost of Goods Manufactured for the Most Recent Year*

	Total
Cost of beginning work-in-process inventory	\$2,000,000
+ Cost of materials used (from Exhibit 3.8)	10,000,000
+ Direct labor	8,000,000
+ Manufacturing overhead	16,000,000
– Cost of ending work-in-process inventory	1,000,000
= Cost of goods manufactured	<u>\$35,000,000</u>

Exhibit 3.10 *Vulcan Forge: Cost of Goods Sold for the Most Recent Year*

	Total
Cost of beginning finished goods inventory	\$2,000,000
+ Cost of goods manufactured (Exhibit 3.9)	35,000,000
– Cost of ending finished goods inventory	5,000,000
= Cost of goods sold	<u>\$32,000,000</u>

Exhibit 3.11 *Vulcan Forge: Income Statement for the Most Recent Year*

	Total
Revenues	\$45,000,000
Cost of goods sold	32,000,000
Gross margin	<u>\$13,000,000</u>
Selling and administration	11,000,000
Profit before taxes	<u>\$2,000,000</u>

As discussed earlier, the cost of goods sold represents the product costs associated with the items *sold* during the year. It is not necessarily the same as the cost of goods manufactured during the year. As shown in Exhibit 3.10, Vulcan Forge uses the inventory equation to reconcile cost of goods manufactured and cost of goods sold. As we see from this exhibit, we obtain the cost of goods sold (\$32 million) by adding together the beginning finished goods inventory (\$2 million) and the cost of goods manufactured (\$35 million from Exhibit 3.8) and subtracting the cost of ending finished goods inventory (\$5 million).

Notice that the cost of goods manufactured exceeds the cost of goods sold by \$3 million. Naturally, Vulcan's finished goods inventory increases by the same amount: \$2 million at the start to \$5 million at the end of the period.

Finally, Exhibit 3.11, which conforms to GAAP, presents Vulcan's income statement for the most recent year of operations.

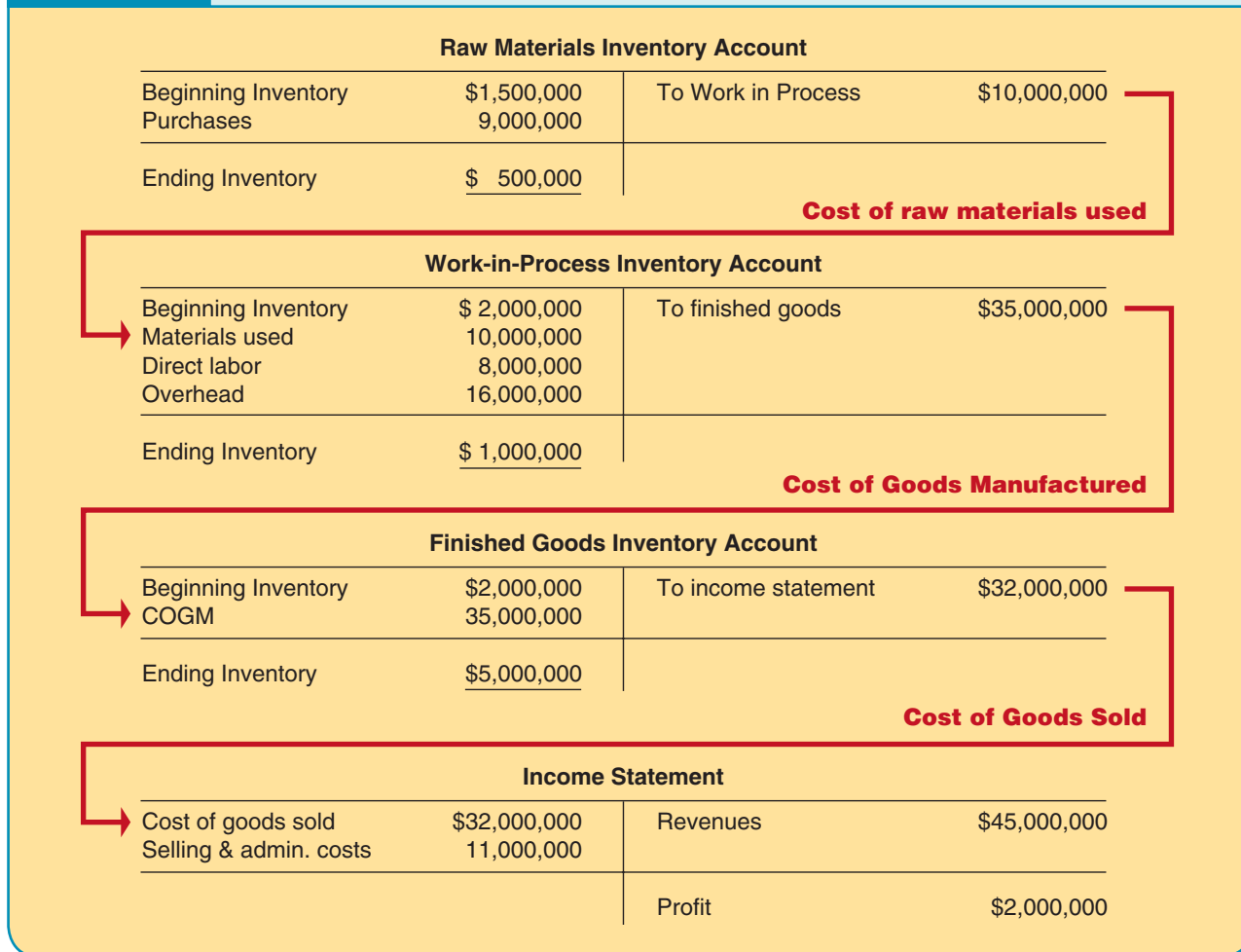
Exhibit 3.12 shows an alternate view of the flow of costs at Vulcan Forge. Recall from Exhibit 3.3 that a merchandising firm has one significant inventory



CHAPTER CONNECTIONS

Virtually every organization allocates costs. Allocating manufacturing overhead to value inventory is a prominent reason. This reason does not apply to service and merchandising firms. Even so, these firms allocate costs for a variety of planning and control decisions. We study the many roles for cost allocations in Chapter 9.

Exhibit 3.12 *Flow of Costs through Inventory Accounts in Manufacturing Firms*



Check It! Exercise #2

Suppose Mason Manufacturing provides the following data for the most recent quarter: raw material purchases of \$1,200,000; labor costs of \$845,000; and manufacturing overhead of \$760,500. Mason also informs you that it had \$240,000; \$50,000; and \$375,000 as its beginning inventories for raw materials, work in process, and finished goods, respectively. The corresponding ending inventory values were \$320,000; \$100,000; and \$294,500, respectively. Verify that (1) the cost of raw material used is \$1,120,000, (2) cost of goods manufactured is \$2,675,500, and (3) cost of goods sold is \$2,756,000.

Solution at end of chapter.

account: merchandise inventory. A manufacturing firm, however, has three inventory accounts: raw materials, work in process, and finished goods. Yet the final income statement looks the same for service, merchandising, and manufacturing firms.

Cost Allocations

LEARNING OBJECTIVE 5

Allocate overhead costs to products.

We next turn to an issue of how firms assign overhead costs, for example, when multiple products exist. In such cases, a firm will have multiple work-in-process and finished goods accounts, one for each product. We can directly assign the costs of materials and labor to each WIP and FG account because we can trace these costs to each product.

However, assigning manufacturing overhead to *individual* work-in-process accounts poses a problem. Overhead costs are indirect and, as such, are not traceable to each product. We did not face this issue with Vulcan Forge because it has one WIP account and one FG account related to its one product, 5-ton hooks. Firms with multiple products resolve this issue by *allocating* overhead costs to products on some justifiable basis. In this section, we describe the cost allocation procedures commonly used in organizations.

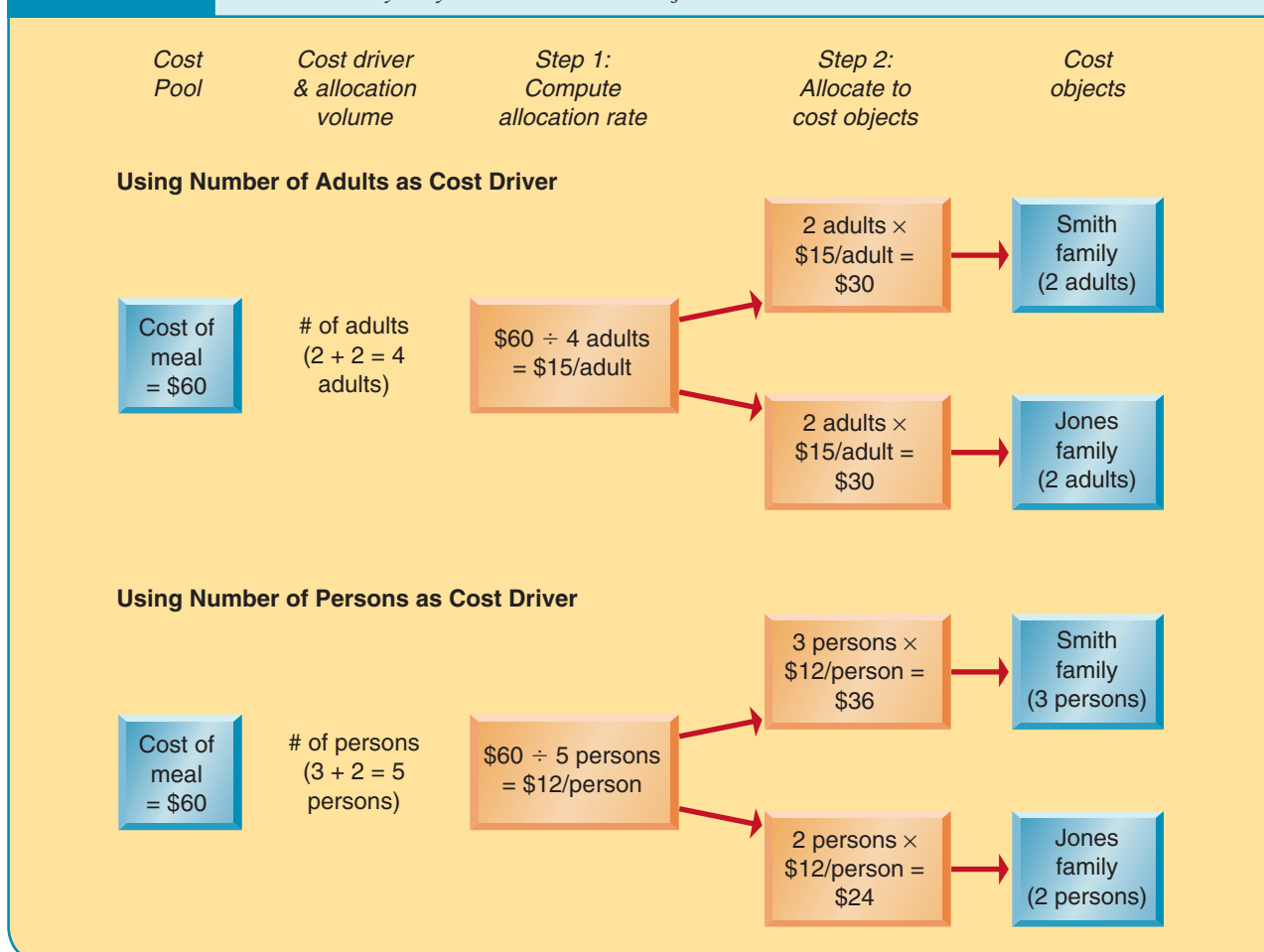
A **cost allocation** is a procedure that allocates, or distributes, a common cost. Suppose two families share a \$60 meal. The Smith family has three persons—an adult couple and their child. The Jones family has two persons—an adult couple. How might we allocate the \$60 cost of their meal? Exhibit 3.13 illustrates the allocation process we might follow.

We start by considering four elements that are in every cost allocation: cost pools, cost objects, cost drivers, and allocation volume.

- **Cost Pool**—the total costs to allocate. Our cost pool is \$60, the cost of the meal.
- **Cost Objects**—the items or entities to which we allocate the costs in the cost pool. In our example, we have two cost objects: the Smith family and the Jones family.
- **Cost Driver (Allocation Basis)**—attributes that we can measure for each cost object. For example, we could use the number of persons in each family as the attribute, or the number of adults, the number of males, the number of left-handed people, and so forth. For our example, if we select the number of persons as the allocation basis, then the Smith family has three units of the cost driver, and the Jones family has two units. Suppose the restaurant had a “kids eat free” promotional special. Then we might select the number of adults as the allocation basis, in which case the Smith and the Jones families each have two units of the cost driver. While we can choose any attribute to be an allocation basis, we often choose attributes that have a *causal* relation between the attribute and the costs incurred. We distinguish such allocation basis by terming them a *cost driver*.
- **Allocation Volume (Denominator Volume)**—the sum of the cost driver amounts across all cost objects. In our example, if the number of persons is the cost driver, then the allocation or denominator volume is five persons. If the number of adults is the cost driver, then the allocation volume is four persons. Managers emphasize causal links by reserving the term *denominator volume* for allocations that employ cost drivers.

After considering these elements, the allocation procedure itself consists of two steps. The yellow boxes in Exhibit 3.13 represent these steps.

- **Determine the Allocation Rate (Overhead Rate).** Calculate the **allocation rate** by dividing the amount in the cost pool by the denominator volume. When the number of persons is the cost driver, our allocation rate is $\$60/5 \text{ persons} = \12

Exhibit 3.13 *There Are Many Ways to Allocate the Cost of a Meal between Two Families*


per person. When the number of adults is the cost driver, our allocation rate is $\$60/4 \text{ adults} = \15 per adult . Because overhead costs are the subject of most cost allocations, many refer to the allocation rate as the **overhead rate**.

- **Allocate the Cost.** Multiply the number of cost driver units contained in each cost object by the allocation rate. When the number of persons is the cost driver, then the Smith family pays $3 \text{ persons} \times \$12/\text{person} = \$36$, whereas the Jones family pays $2 \text{ persons} \times \$12/\text{person} = \$24$. However, when the number of adults is the cost driver, then both cost objects (both families) pay the same amount: $2 \text{ adults} \times \$15 \text{ per adult} = \$30 \text{ per family}$.

Notice that, regardless of the cost driver we choose, the sum of the allocations equals the cost pool. When the number of persons is the cost driver, the allocations total $\$36 + \$24 = \$60$. When the number of adults is the cost driver, the allocations total $\$30 + \$30 = \$60$.

As you can see from the example, allocations divide the costs in the cost pool in proportion to the number of cost driver units in each cost object. When the number of persons is the cost driver, we allocate 60% of the cost to the Smith family because this family accounts for 60% of the cost driver units (persons). When the number of adults is the cost driver, each family pays \$30 instead of the \$36/\$24 split. Therefore, we allocate 50% of the cost to each family because each family contributes 50%



We often share the cost of a meal. Such sharing is a cost allocation. (Radius Images/Masterfile)

of the driver units. Regardless of the chosen cost driver, *the proportion of cost allocated to a cost object equals the proportion of driver units in that cost object.*

As our example illustrates, the cost driver we choose can greatly affect the results of cost allocations. In Module III, we discuss how to select the appropriate cost driver.

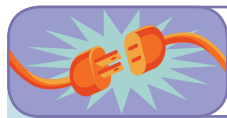
How do cost allocations affect the cost flows at Vulcan Forge? Suppose Vulcan produces two products, 5-ton hooks and 10-ton hooks. Vulcan would now have two WIP and two FG accounts, one for each product. Because Vulcan can identify the amount of materials and labor consumed by each product, both materials and labor costs would be directly traced to each WIP account and, in turn, each FG account.

The issue then rests on what Vulcan would do with the \$16 million in overhead costs (see Exhibit 3.9). Because these costs are common to both products, they need to be allocated to determine the cost of each product. Assume Vulcan decides to allocate these costs based on the number of hooks produced and that, for the most recent year, Vulcan produced 15,000 5-ton hooks and 10,000 10-ton hooks. First, we identify the four elements:

- **Cost pool.** \$16 million, the overhead to be allocated.
- **Cost object.** Each type of hook (5-ton hook and 10-ton hook)
- **Cost driver.** The quantity of hooks produced (15,000 units of the 5-ton hook and 10,000 units of the 10-ton hook)
- **Allocation volume.** The sum of the cost driver units. 15,000 units + 10,000 units = 25,000 units

Following the two-step allocation procedure, we have:

- **Determine the allocation rate (overhead rate).** In general, regardless of the number of products or the allocation basis, *this step consists of calculating the overhead rate by dividing the total overhead cost (the cost pool) by the total of the driver units (allocation volume).* Thus $\$16,000,000$ (cost pool) / 25,000 total hooks (allocation volume) = \$640 per hook (allocation rate).
- **Allocate the cost.** In general, *the overhead allocated to an individual unit or product line is the number of driver units contained in that unit or product line times the overhead*



Connecting to Practice

GUMP ACCOUNTING

The blockbuster movie, *Forrest Gump*, grossed over \$657 million in the box office. It generated millions more in video sales and product tie-ins. While analysts believe that the movie generated over \$350 million in net cash flows, Paramount Studio's account suggested that the movie lost \$62 million. The movie *Coming to America* also suffered a similar fate. In both cases, the studio arrived at the loss after allocating the common costs it incurs to make and distribute all movies.

COMMENTARY: The studio chose cost drivers such as gross receipts to allocate common costs. Part of the rationale for such a choice might be to reduce the payout to movie stars, screenwriters, and others who receive a cut of the profit from the movie. This argument has lost bite in recent years as movie stars and directors now contract for the payout to be a percentage of the gross revenue, which is unaffected by any cost allocation.



Check It! Exercise #3

Suppose Vulcan Forge decides to allocate the \$16,000,000 in overhead costs on the basis of direct labor hours. Each 5-ton hook requires 25 labor hours, and each 10-ton hook requires 42.50 labor hours. Verify that Vulcan would allocate \$7,500,000 in overhead to the 5-ton hooks and \$8,500,000 in overhead to the 10-ton hooks.

Solution at end of chapter.



CHAPTER CONNECTIONS

While the essential allocation process is the same, actual accounting systems must deal with numerous types of costs and products. Firms usually tailor their accounting systems to their production processes. Grouping firms by the nature of their product, we can anchor one end with firms that make one-of-a-kind products and the other end with firms that produce large volumes of standardized goods. In Chapters 14 and 15, we study job-costing and process-costing, which are the accounting systems that correspond to these two extremes.

rate per driver unit. Thus, for the cost object of 5-ton hooks, Vulcan would allocate $15,000 \text{ hooks} \times \$640 \text{ per hook} = \$9,600,000$ in overhead. For the 10-ton hooks, Vulcan would allocate $10,000 \text{ hooks} \times \$640 \text{ per hook} = \$6,400,000$ in overhead.

Therefore, in addition to the direct materials and direct labor costs traceable to each hook, the \$9,600,000 and \$6,400,000 in allocated overhead would flow through each product's WIP account. When the hooks are finished, these costs would flow through to the FG accounts. They will become part of the COGS when Vulcan sells the associated products.

GAAP gives firms considerable leeway regarding their choices of how to allocate manufacturing overhead to products. Commonly used allocation bases include direct labor hours, direct labor cost, machine hours, and the number of units. Usually, firms pick a *cost driver* that exhibits a cause-effect relation with the cost being allocated. As we will learn in Chapter 9, their choice arises from their desire to use the allocation both to value inventory and to estimate the long-run change in capacity costs. Thus, firms often allocate supervisory costs and materials handling costs using direct labor cost and materials cost, respectively, as the allocation basis. They expect that, over the long term, changes in labor cost will trigger or “drive” a proportional change in supervisory costs. A similar rationale holds for using materials cost as the basis for allocating the costs of handling materials.

BEWARE OF ALLOCATED COSTS WHEN MAKING DECISIONS

As we discussed earlier with Hercules, GAAP income statements combine controllable costs with noncontrollable costs and fixed costs with variable costs. As a result, it is difficult to use the summary data provided by GAAP income statements for internal decision making. Indeed, as Exhibit 3.14 illustrates, allocating overhead costs can make non-controllable fixed costs appear to be controllable and variable.

Exhibit 3.14 <i>GAAP Income Statement</i>		
	Amount per unit	Total
Number of units sold		30,000
Price/Revenues	\$25.00	\$750,000
Cost of goods sold:		
Direct materials	6.00	180,000
Direct labor	8.00	240,000
Allocated manufacturing overhead (50% is variable, 50% is fixed)	4.00	120,000
Gross margin	\$7.00	\$210,000
Selling and administration (30% is variable, 70% is fixed)	5.00	150,000
Profit before taxes	\$2.00	\$60,000

This report suggests that the firm increases its profit by \$2.00 for each additional unit sold. The report also suggests that the product costs \$23.00 to make and sell, meaning that a price lower than \$23.00 would be unacceptable. Thus, the firm would reject a one-time offer to buy 1,000 units at \$22.50, even if the firm had the capacity to accommodate this request.

While intuitively appealing, this decision would be incorrect! Why? The answer is that the report combines variable costs (direct materials, direct labor, variable overhead, variable selling and administrative) and fixed costs (fixed overhead, fixed selling, and administration). Only the revenues and variable costs would be controllable in the short term. Here, the variable cost per unit consists of \$6.00 direct materials + \$8.00 direct labor + \$2.00 variable overhead + \$1.50 variable selling and administration, or \$17.50 per unit. Therefore, the offer to buy the units at \$22.50 per unit actually increases profit by \$5.00 per unit, and a total of \$5,000 in increased profit for 1,000 units.

To facilitate decisions, many firms prepare reports that regroup costs by their variability, as shown in Exhibit 3.15. In Chapter 4, we will closely examine these statements, which we call contribution margin income statements.

WRAPPING IT UP

Now that you understand cost flows and reporting systems, what is the best course of action with regard to Hercules? Hercules is a service organization—it does not

Exhibit 3.15 <i>Contribution Margin Income Statement</i>		
	Amount per unit	Total
Number of units sold		30,000
Price/Revenues	\$25.00	\$750,000
Direct materials	6.00	180,000
Direct labor	8.00	240,000
Allocated variable overhead	2.00	60,000
Variable selling and administration	1.50	45,000
Contribution margin	\$7.50	\$225,000
Allocated fixed overhead	2.00	60,000
Fixed selling and administration	3.50	105,000
Profit before taxes	\$2.00	\$60,000

APPLYING THE DECISION FRAMEWORK

What Is the Problem?	What data should you use to estimate the profit impact of offering yoga?
What Are the Options?	You naturally turn to the accounting system to obtain cost and revenue data. Your options relate to whether to modify and how to modify Hercules' system to suit your needs.
What Are the Costs and Benefits?	Modifying the system is costly in terms of time, effort, and the expertise required. However, it can lead to benefits in terms of a more accurate profit estimate.
Make the Decision!	You decide that you can rely on expenses reported in financial statements to estimate the costs and benefits of offering yoga. However, you will first have to estimate variable and fixed costs. You also have to consider if any fixed costs would change because of the decision.

have much in the way of inventories. However, you still need to modify Hercules' accounting system to determine the variable and fixed costs, and thus the change in profit associated with offering yoga. We take up this task in Chapter 4.

SUMMARY

In this chapter, we discussed accounting systems that you are likely to encounter in the workplace. Most firms' accounting systems are set up to comply with GAAP, sharply delineating between product and period costs. We discussed how such systems accumulate costs for financial reporting purposes as well as the similarities and differences in cost flows for service, merchandising, and manufacturing firms. Finally, we illustrated how allocations play an important role in determining inventory values and cost of goods sold in manufacturing firms and how the use of summary income statement data can lead to poor decisions.

In the next module (Chapters 4–8), we examine short-term decisions. Because financial reporting requirements influence accounting systems, the data we find often are not suitable for decision making. To make effective decisions, we need information about the controllability and variability of costs and benefits. In the next chapter, we examine how to modify the data from accounting systems to suit the needs of internal decision makers.

RAPID REVIEW

LEARNING OBJECTIVE 1

Distinguish product costs from period costs.

- One of the important functions of accounting systems in organizations is to provide information for the preparation of financial statements such as the income statement, balance sheet, and statement of cash flows.
- Financial accounting systems classify costs according to business function. Costs related to the primary business function are product costs, and costs related to support functions are period costs.

- Product costs appear “above the line” in computing the gross margin. Period costs appear “below the line” after computing the gross margin.

LEARNING OBJECTIVE 2

Understand the flow of costs in service firms.

- The hallmark of a service firm is that the products it offers are neither tangible nor storable.
- Because service firms' products are neither tangible nor storable, they do not maintain inventories of their final products.

LEARNING OBJECTIVE 3

Discuss how inventories affect the flow of costs in merchandising firms.

- Merchandising firms sell substantially the same products they purchase. Most merchandising firms maintain an inventory of goods that they buy and sell; they use this inventory to display items, obtain volume discounts, and ensure product availability.
- The presence of inventory means that costs on purchases often do not equal the expense related to the cost of goods sold.
- Merchandising firms use an inventory equation to determine the cost of goods sold during the period. Cost of goods sold = the value of beginning inventory + the cost of purchases – the value of ending inventory.
- Because merchandising firms buy goods at different times and different prices, they make inventory cost flow assumptions such as FIFO or LIFO to compute the value of inventory and cost of goods sold.
- As with service firms, merchandising firms' income statements report the cost of goods sold above the line for gross margin, and all other costs below this line.

LEARNING OBJECTIVE 4

Explain the cost terminology and the flow of costs in manufacturing firms.

- Unlike merchandising firms, manufacturing firms use labor and equipment to substantially transform inputs such as raw materials and components into outputs.
- While merchandising firms have one primary inventory account, manufacturing firms have three: raw materials, work-in-process, and finished goods. Given this, and the variations in manufacturing production processes, manufacturing firms have complex cost flows and cost terminology.
- Typical inputs in a manufacturing firm include direct materials, direct labor, and overhead. Prime costs are the sum of direct materials and direct labor costs, and conversion costs are the sum of direct labor and manufacturing overhead costs.
- Product costs are the sum of all manufacturing costs. These costs flow through the firm's inventory accounts. Nonmanufacturing costs are period costs. Firms expense these costs in their income statements during the period incurred.

- Applying the inventory equation to the raw materials inventory yields the costs of materials used. This amount plus the cost of direct labor and manufacturing overhead is the input into the work-in-process (WIP) account. Adjusting the total by the beginning and ending balances in the WIP account yields the cost of goods manufactured, which is the inflow into the inventory of finished goods (FG). Once again, adjusting for beginning and ending balances in the FG account yields the cost of goods sold, the amount expensed in the income statement.

LEARNING OBJECTIVE 5

Allocate overhead costs to products.

- To allocate is to distribute, and a cost allocation is a procedure that distributes a common cost among the items giving rise to the cost. Firms need to allocate overhead costs because they are common to products. In contrast, direct materials and direct labor can be traced to products.
- There are four elements in every cost allocation:
 - (1) Cost pool—the total costs to allocate
 - (2) Cost objects—the items or entities to which we allocate costs
 - (3) Cost driver (allocation basis)—attributes that we can measure for each cost object; they are used to distribute costs in the cost pool among cost objects
 - (4) Allocation volume (denominator volume)—the sum of the cost driver amounts across all cost objects
- Cost allocation procedures consist of two steps:
 - (1) Calculate the allocation rate by dividing the cost pool by the allocation volume.
 - (2) Use the allocation rate to assign costs to each cost object by multiplying the cost driver units contained in a specific cost object by the allocation rate.
- Every allocation divides the costs in the cost pool in proportion to the number of cost driver units corresponding to each cost object.
- While allocations play an important role in calculating product cost for financial reporting purposes, it is important to remember that such allocations—found in GAAP income statements—mingle controllable and noncontrollable costs and variable and fixed costs.

ANSWERS TO CHECK IT! EXERCISES

Exercise #1: We have:

Cost of beginning inventory		\$3,450,200
+ Cost of goods purchased	+	24,795,740
– Cost of ending inventory	–	3,745,600
= Cost of goods sold	=	\$24,500,340

Exercise #2: Raw materials used = Beginning materials inventory + purchases – ending materials inventory. Thus, $\$1,120,000 = \$240,000 + \$1,200,000 - \$320,000$.

Beginning WIP inventory + materials used + labor cost + manufacturing overhead – ending WIP inventory = Cost of goods manufactured.

Thus, $\$50,000 + \$1,120,000 + \$845,000 + \$760,500 - \$100,000 = \$2,675,500$.

Beginning FG inventory + COGM – ending FG inventory = Cost of goods sold. Thus, $\$375,000 + \$2,675,500 - \$294,500 = \$2,756,000$.

Exercise #3: Allocation volume = (15,000 5-ton hooks × 25 labor hours per hook) + (10,000 10-ton hooks × 42.50 labor hours per hook) = (375,000 labor hours + 425,000 labor hours) = 800,000 labor hours.

Allocation rate = $\$16,000,000$ in overhead costs / 800,000 labor hours = $\$20$ per labor hour.

Amount allocated to 5-ton hooks = allocation rate × cost driver units = $\$20$ per labor hour × 375,000 labor hours = $\$7,500,000$.

Amount allocated to 10-ton hooks = allocation rate × cost driver units = $\$20$ per labor hour × 425,000 labor hours = $\$8,500,000$.

SELF-STUDY PROBLEMS

SELF-STUDY PROBLEM #1:

Cost Flows in Manufacturing Firms

DigJam Industries makes dyes used to color fabrics. The following data pertain to its operations for the most recent year:

Raw materials beginning inventory	\$60,000
Raw materials ending inventory	\$80,000
WIP beginning inventory	\$80,000
WIP ending inventory	\$105,000
Finished goods beginning inventory	\$300,000
Finished goods ending inventory	\$250,000
Raw materials issued to production	\$225,000
Manufacturing overhead	\$360,000
Total manufacturing costs charged to production (= raw materials issued to production + direct labor + manufacturing overhead)	\$885,000
Cost of goods available for sale (= beginning balance in finished goods + cost of goods manufactured)	\$1,160,000
Revenues	\$1,150,000
Selling and administrative costs	\$147,000

- a. Calculate the cost of raw materials purchased during the year.

The inventory equation for the raw materials account is:

Ending balance = Beginning balance + Raw materials purchased – Raw materials issued to production. Thus,

$$\$80,000 = \$60,000 + \text{raw materials purchased} - \$225,000.$$

$$\text{Raw materials purchased} = \mathbf{\$245,000}.$$

- b. Calculate the cost of direct labor charged to production.

Total manufacturing costs charged to production = raw materials issued to production + direct labor cost + manufacturing overhead.

$$\$885,000 = \$225,000 + \text{Direct labor cost} + \$360,000.$$

$$\text{Direct labor cost} = \$885,000 - \$225,000 - \$360,000 = \mathbf{\$300,000}.$$

- c. Calculate the cost of goods manufactured during the year.

The inventory equation for the work-in-process account is:

Ending balance = Beginning balance + Total manufacturing costs charged to production – Cost of goods manufactured.

$$105,000 = \$80,000 + \$885,000 - \text{Cost of goods manufactured}.$$

$$\text{Cost of goods manufactured} = \mathbf{\$860,000}.$$

Alternatively, we can calculate:

Cost of goods manufactured = Cost of goods available for sale – Beginning balance in finished goods.

$$\$1,160,000 - \$300,000 = \mathbf{\$860,000}.$$

- d. Calculate the cost of goods sold during the year.

We can express cost flows through the finished goods account using the following equation:

$$\text{Ending balance} = \text{Beginning balance} + \text{Cost of goods manufactured} - \text{Cost of goods sold.}$$

$$\$250,000 = \$300,000 + \$860,000 - \text{Cost of goods sold.}$$

$$\text{Cost of goods sold} = \mathbf{\$910,000.}$$

Alternatively, we can calculate:

$$\text{Cost of goods sold} = \text{Cost of goods available for sale} - \text{Ending balance in finished goods.}$$

$$\$1,160,000 - \$250,000 = \mathbf{\$910,000.}$$

- e. Prepare DigJam's GAAP income statement for the most recent year.

The following table presents DigJam's GAAP income statement for the most recent year.

DigJam Industries		
Income Statement for the Most Recent Year		
Revenues		\$1,150,000
Beginning FG inventory	\$300,000	
+ Cost of goods manufactured	860,000	
– Ending FG inventory	<u>250,000</u>	
= Cost of goods sold		<u>\$910,000</u>
Gross margin		<u>\$240,000</u>
Selling & administration costs		<u>147,000</u>
Profit before taxes		<u>\$93,000</u>

SELF-STUDY PROBLEM #2:

Cost Allocations, Product Cost

Precision Bearings manufactures several kinds of roller bearings. This past year, Precision spent \$11,750,000 on manufacturing overhead costs and \$23,500,000 for direct labor. Precision produced 5,875,000 bearings and sold 5,500,000 bearings during the year.

The following table provides the direct materials, direct labor, and selling and administrative (S&A) costs per unit for three of Precision's bearings:

	<i>Model 6203</i>	<i>Model 6210</i>	<i>Model 30207</i>
Direct materials	\$1.00	\$1.75	\$3.00
Direct labor	\$3.00	\$4.00	\$7.00
S & A	\$0.50	\$0.75	\$1.00

- a. Assume that Precision allocates overhead costs using the number of units produced as the cost driver. What is the unit product cost (inventoriable cost) for each of the three bearings?

Under GAAP, product cost is the sum of direct materials, direct labor, and manufacturing overhead. Product cost does not include any selling or administrative costs; these costs are treated as period expenses.

Furthermore, Precision allocates overhead costs to products using units produced as the cost driver. We now use the two steps outlined in the text for allocating costs.

Step 1: We first calculate the allocation rate by dividing the costs contained in the cost pool by the denominator volume.

$$\$11,750,000 / 5,875,000 \text{ units} = \$2.00 \text{ per unit}$$

Notice that we use total production to allocate costs as the \$11,750,000 relates to units produced, not just units sold.

Step 2: With the allocation rate in hand, we can determine the unit product cost for each kind of bearing:

	<i>Model 6203</i>	<i>Model 6210</i>	<i>Model 30207</i>
Materials cost	\$1.00	\$1.75	\$3.00
Labor cost	3.00	4.00	7.00
Allocated overhead	<u>2.00</u>	<u>2.00</u>	<u>2.00</u>
Product cost	\$6.00	\$7.75	\$12.00

Again, we emphasize that selling and administrative costs are not included in inventoriable costs.

- b. Assume that Precision allocates overhead costs using direct labor costs as the cost driver instead of the number of units produced. What is the unit product cost (inventoriable cost) for each of the three bearings?

This change in the cost driver will change the rate that we use to allocate overhead costs.

Step 1: Compute the allocation rate. Plugging in the numbers from the problem,
 $\$11,750,000/\$23,500,000$ in labor costs = \$0.50 per labor \$

Step 2: Allocate costs. With this rate in hand, we can determine the unit product cost for each bearing:

	<i>Model 6203</i>	<i>Model 6210</i>	<i>Model 30207</i>
Materials cost	\$1.00	\$1.75	\$3.00
Labor cost	3.00	4.00	7.00
Allocated overhead	1.50	2.00	3.50 ¹
Product cost	\$5.50	\$7.75	\$13.50

¹ \$1.50 = \$3.00 labor \$ × \$0.50/labor \$; \$2.00 = \$4.00 labor \$ × \$0.50/labor \$; \$3.50 = \$7.00 labor \$ × \$0.50/labor \$.

For each bearing, we compute the allocated manufacturing overhead as the labor cost of each bearing × allocation rate per labor \$. Notice again that we do not use S&A costs to determine product costs.

c. Compare your answers to parts (a) and (b), and discuss any differences in product cost.

We find that the product cost for 6203 has decreased, the product cost for 30207 has increased, and the product cost for 6210 has not changed.

To understand the difference, notice that when Precision allocates overhead costs using units, each bearing gets an equal share of overhead. However, when Precision allocates using labor cost, allocated overhead is proportional to the bearings' labor cost.

The "average bearing" consumes \$4 of labor ($\$23,500,000/5,875,000$ bearings). *There would be no difference due to the change in the allocation basis only if each kind of bearing actually did consume \$4 per bearing in labor costs.* However, this equivalence is not true. Thus, bearings with lower than average labor cost (e.g., 6203) will experience a reduction in reported cost if Precision changes its allocation basis from units to labor cost. Conversely, bearings with higher than average labor cost (e.g., 30207) experience an increase in reported costs.

Note: Although the product cost of each individual bearing changes depending on the allocation basis chosen, the total overhead costs allocated to all bearings will be \$11,750,000—regardless of the allocation basis chosen.

d. Do you believe product cost, as computed under GAAP, is sufficient for determining a product's profitability?

Unfortunately, the product cost computed under GAAP is not enough for assessing a product's profitability. Why? For assessing a product's profitability, we wish to include all controllable costs and exclude all noncontrollable costs. As discussed in the text, GAAP excludes selling and administrative costs, both variable and fixed, from a product's product cost. Many of these costs, such as those related to shipping, distribution, and sales commissions are controllable at the product level. Accordingly, it is important to include such costs when assessing a product's profitability.

In addition, by allocating all fixed manufacturing costs, noncontrollable costs often are included in product cost. This could occur, for example, with items such as factory rent, which may not be controllable even over an extended horizon.

GLOSSARY

Allocation basis Same as "cost driver."

Allocation rate The cost pool divided by the allocation volume.

Allocation volume The sum of the cost driver amounts across all cost objects.

Capacity costs The sum of variable and fixed overhead costs.

Conversion costs The sum of direct labor and manufacturing overhead costs.

Cost allocation A procedure that distributes a common cost among the items giving rise to the cost.

Cost driver Attributes that we can measure for each cost object that are used to distribute the cost pool among cost objects.

Cost of goods manufactured (COGM) The cost of items finished and transferred from work in process inventory to finished goods inventory.

Cost of goods sold (COGS) The cost of products sold in a period. The cost of items transferred from finished goods inventory to the income statement.

Cost objects The items, or entities, to which costs are to be allocated.

Cost pool The total costs to be allocated.

Denominator volume Same as “allocation volume.”

Direct labor Labor costs that can be traced to individual units of a product in a cost-effective manner.

Direct materials Materials costs that can be traced economically to individual units of a product.

Fixed overhead Indirect manufacturing costs that do not vary with production volume.

Gross margin Revenues less product costs.

Inventoriable costs See Product costs.

Manufacturing firm A firm that uses labor and equipment to transform inputs such as materials and components into outputs.

Manufacturing overhead The sum of all indirect manufacturing costs.

Merchandising firm A firm that resells essentially the same product it buys from suppliers.

Overhead Same as manufacturing overhead.

Overhead rate Term frequently used to refer to “allocation rate.”

Period costs A financial accounting concept under GAAP. Any cost that is not a product cost. A cost related to the selling of goods and the administration of the organization.

Prime costs The sum of direct materials and direct labor costs, as these are the primary inputs into the production process.

Product costs A financial accounting concept under GAAP. Any cost associated with getting products and services ready for sale.

Selling and administration costs Nonmanufacturing costs. A term frequently used to refer to “period costs.”

Service firm A firm whose product is neither tangible nor storable.

Total manufacturing costs charged to production The sum of materials, labor, and overhead added to the work-in-process account during the period.

Variable overhead Indirect manufacturing costs that vary with production volume.

REVIEW QUESTIONS

- 3.1 LO1. What is the difference between a product cost and a period cost?
- 3.2 LO1. What is the gross margin?
- 3.3 LO1. Why does GAAP require firms to distinguish between product and period costs?
- 3.4 LO2. What is the key characteristic of a service firm?
- 3.5 LO3. What is the key characteristic of a merchandising firm?
- 3.6 LO3. What is the inventory equation?
- 3.7 LO4. What is the key characteristic of a manufacturing firm?
- 3.8 LO4. Why do we frequently refer to materials and labor costs as being both direct and variable?

- 3.9 LO4. What is the difference between variable manufacturing overhead and fixed manufacturing overhead?
- 3.10 LO4. Define the terms *prime costs* and *conversion costs*.
- 3.11 LO5. What are the four elements of every cost allocation?
- 3.12 LO5. Describe the two-step procedure for allocating costs.
- 3.13 LO5. What is the relation between the proportion of cost allocated to a cost object and the proportion of driver units in the cost object?

DISCUSSION QUESTIONS

- 3.14 LO2. Consider a consulting firm that completes large software projects that often take two or more years to complete. What is the nature of inventory for such a firm? How should it value this inventory?
- 3.15 LO2. A restaurant converts inputs into substantially different outputs, a key characteristic of a manufacturing firm. Yet, most would classify a restaurant as a service firm. How would you classify a restaurant? Why?
- 3.16 LO2 (Advanced). Consider a firm such as U-Haul that supplies trucks that we could rent to move goods. (Ignore other aspects of U-Haul’s operations.) To meet demand, which is usually seasonal and focused on a

few weeks each year, U-Haul keeps a large supply of trucks. Would you classify this firm as a service firm or as a merchandising firm? What conclusions do you draw about the distinctions between service and merchandising firms?

- 3.17 LO3. List three reasons why a merchandising firm holds inventory.
- 3.18 LO3. Should a retail firm include the cost of receiving and stocking goods when computing inventory values?
- 3.19 LO3 (Advanced). Many merchandising firms charge the entire amount of transportation costs to cost of goods sold. Other merchandising firms perform a

year-end allocation to distribute the cost between the inventory and cost of goods sold. How might firms justify not tracing transportation costs to individual products and flowing these costs through the inventory accounts?

- 3.20 LO4 (Advanced).** GAAP excludes most research and development costs from its definition of inventoriable costs. Why do you believe GAAP mandates such a treatment?
- 3.21 LO1, LO4 (Advanced).** Do you expect reported income and operating cash flows for a service firm to be close in magnitude? Would your answer differ for a manufacturing firm? Why?
- 3.22 LO4.** As you know, direct materials, direct labor, and manufacturing overhead are the three major components of manufacturing costs. Expressing each part as a percentage of the total manufacturing cost, how do you think the percentages of these costs have changed over the last 50 years?
- 3.23 LO4 (Advanced).** Give an example of a manufacturing firm where labor is a major cost component. Give

another example in which labor is a negligible part of total manufacturing cost. How do you reconcile these observations?

- 3.24 LO5.** Assume a firm is deciding between labor hours and machine hours as a cost driver. When would these drivers yield the same allocations?
- 3.25 LO5.** “Depreciation is nothing but an allocation of the purchase price over different accounting periods.” Do you agree with this statement? If so, identify the elements of cost allocations (cost pool, cost objects, cost driver, allocation volume) implicit in the computation of depreciation. If not, identify differences between cost allocations and depreciation.
- 3.26 LO1, LO5.** What is the most important asset for a professional services firm? Given your answer, what is a reasonable basis for allocating the costs of this “asset” to individual projects?
- 3.27 LO5.** Usually, we think of cost allocations as the process of splitting the cost of a shared resource among its users. When might a firm allocate *revenue*?

EXERCISES

- 3.28 Product versus period cost (LO1).** The following are some of the costs incurred by a consulting firm.

Salary paid to consultants	Fee for attending training seminar
Salary to office administrator	Corporate office rent
Cost of general-purpose software	Travel to client site

Required:

Classify each cost as a product cost (above the line for gross margin) or a period cost (below the line for gross margin).

- 3.29 Cost flows in a service firm (LO2).** The following data pertain to Boyd Associates, a consulting company.

Revenues	\$1,600,450
Gross margin	450,000
Profit before taxes	275,400

Required:

Complete a GAAP income statement to determine (a) the firm’s cost to provide service and (b) its marketing and administration costs.

- 3.30 Cost flows in a service firm (LO2).** The following data pertain to Skogg Consulting. Skogg provides advice on structural engineering for large projects such as stadiums and bridges. Clients seek Skogg out because it has extensive contacts and can find the person who is “right” for the job. This is a nontrivial task, as often fewer than 10 persons worldwide might have the required expertise. Skogg bills clients at the rate of \$350 per hour plus actual expenses for travel and board. The firm draws consultants from a roster it maintains, and it pays the consultant \$300 per hour. The balance of \$50 goes toward administrative support. The firm expects to accumulate 9,000 consulting hours for the year and projects a profit before taxes of \$230,000.

Required:

Complete a GAAP income statement to determine (a) the firm’s cost to provide service and (b) its marketing and administration costs.

- 3.31 Cost flows in a service firm, cost classifications (LO1, LO2).** Brad Timberlake is known throughout the world for his insights on effective and efficient time management. Currently, Brad offers 35 daylong seminars each year at locations throughout North America,

Europe, and Asia. The average seminar has 125 participants, each of whom pays a \$400 fee. The variable costs (folder, worksheets, copy of Brad's book, and food) amount to \$75 per participant. In addition, setting up the seminar itself (the use of a hotel or convention center, hotel staff, and Brad's travel expenses) costs \$20,000 per seminar. Finally, Brad pays a coordinator a salary of \$50,000 per year to organize his seminars and incurs \$250,000 in fixed costs annually to maintain a central office and support staff.

Required:

- Preparing a GAAP income statement for Brad's operations, calculate Brad's gross margin and profit before taxes for the year. Remember to classify all administration costs as below the gross margin and all costs connected with offering the seminar above the gross margin.
- Classify Brad's costs as being unit-, batch-, product-, or facility-level costs, as defined in Chapter 2.
- How does the cost classification in part (b) correspond to the classification of costs into product and period costs in part (a)? Would this correspondence between costs per the cost hierarchy into product and period costs always hold? Provide counterexamples.

3.32 Product versus period cost (LO1, LO3). The following are some of the costs incurred by a merchandising firm.

- Cost of merchandise sold
- Stocking goods on shelves
- Cost of display cases
- Store manager's salary
- Transportation in
- Store rental

Required:

Classify the costs as a product cost (above the line for gross margin) or a period cost (below the line for gross margin).

3.33 Cost flows in a merchandising firm (LO3). MegaLo Mart provides the following information relating to its most recent year of operations. MegaLo Mart charges off the entire cost of transportation in to the income statement for the period.

Revenues	\$14,568,800
Beginning inventory, 1/1	245,600
Ending inventory, 12/31	260,400
Purchases	10,950,325
Transportation in	102,500
Sales commissions	437,064
Store rent	1,435,000
Store utilities	134,675
Other administration	879,345

Required:

Complete a GAAP income statement to determine MegaLo Mart's profit before taxes.

3.34 Cost flow in a merchandising firm (LO3). The following is a condensed income statement for Sweets & Treats, a confectionary.

Sweets & Treats GAAP Income Statement		
<i>Item</i>		<i>Amount</i>
Revenues		\$2,250,300
Beginning inventory, 1/1	\$125,000	
Purchases	?	
Ending inventory, 12/31	\$112,400	
Cost of goods sold		?
Gross margin		\$639,055
Sales & administration		?
Profit before taxes		\$203,555

Required:

Determine (a) the cost of purchases and (b) costs associated with sales and administration.

3.35 Cost categories in manufacturing firms (LO4). Consider the following expenses frequently incurred by manufacturing firms.

1. Connectors used to make a product
2. Labor to machine product components
3. Steel used to make components
4. Drill bits, saw blades, and other tools
5. Salary paid to the factory manager
6. Factory maintenance costs
7. Depreciation on materials-handling equipment
8. Holiday pay paid to assembly workers

Required:

Classify each expense as being direct materials, direct labor, variable manufacturing overhead, or fixed manufacturing overhead. Please note that, for some of the eight expenses, a portion of the cost could be in one category and another portion could be in another category.

3.36 Cost classification, product versus period cost (LO1, LO4). The following costs relate to a manufacturing organization:

Sales commissions	Sales manager salary
Distribution costs	Production supervisor
Factory rent	Corporate office expenses
Product components	Supplies used in manufacturing
Direct manufacturing labor	Plant manager salary

Required:

Classify the costs as product costs or period costs. Also classify the costs as variable or fixed with respect to the volume of production. What inferences do you draw about the correspondence between the two concepts?

3.37 Inventoriable cost (LO4, LO5). The following information pertains to the production of 120,000 units of a product.

Sales price per unit	\$45
Direct materials cost	\$2,400,000
Direct labor cost	720,000
Factory overhead	Allocated to each unit at 140% of labor cost
Sales commission	6% of price
Distribution costs	\$960,000
Selling costs	\$480,000

Required:

- a. Calculate the inventoriable cost per unit of this product.
- b. Do you believe that the inventoriable cost is adequate for evaluating this product's profit per unit?

3.38 Cost flows in manufacturing (LO4). Ace Welding Company's accounting records show that, for the most recent year, the raw materials inventory account had a beginning balance of \$24,000. During the year, Ace purchased \$82,000 of raw materials. At year-end, the raw materials inventory account had a balance of \$25,000.

*Required:*

- a. What was the cost of materials issued out to work in process during the year?
- b. Suppose the work-in-process account had a beginning balance of \$220,000. During the year, the total manufacturing costs charged to operations (including the cost of raw materials, direct labor, and all manufacturing overhead) amounted to \$800,000. The balance of the work-in-process account at the end of the year was \$180,000. What was the cost of goods completed and transferred to finished goods during the year?
- c. Suppose the finished goods account had a beginning balance of \$40,000 and an ending balance of \$85,000. Calculate the cost of goods sold during the year.



3.39 Cost flows in manufacturing (LO4). Dan Wenman makes stainless steel containers used by medical laboratories and other institutions that handle biohazards. Dan has provided you with the following data from the most recent year of operations:

Beginning balance in materials inventory	\$14,000
Beginning balance in work in process	\$28,200
Beginning balance in finished goods	\$8,200
Purchases of materials	\$86,450
Payments for direct labor	\$134,500
Factory overhead charged to products	\$67,250
Ending balance in materials inventory	\$13,750
Ending balance in work in process	\$25,400
Ending balance in finished goods	\$10,300

Required:

Determine (a) the cost of goods manufactured and (b) the cost of goods sold for the most recent year. (Notice that the data do not distinguish between variable and fixed manufacturing overhead. Rather, the problem refers to the total amount as factory overhead.)

3.40 Determining job cost (LO4). Kim and Tim Landry are painting contractors. For an upcoming job, Kim and Tim estimate that they need \$250 worth of paint. In addition, they expect to spend 45 person-hours on the job. Kim and Tim pay their workers \$12 per hour (including all benefits). They also expect to use several brushes, scaffolding, and other ancillary items, although it is difficult to estimate this use exactly. Finally, Kim and Tim estimate that they will spend four hours in preparing the bid; this includes driving to the customer's home to evaluate the work required and going to the store to buy paint. Kim and Tim price their time at \$20 per hour. In preparing bids, Kim and Tim mark up the total cost of materials and labor (including their labor) by 40% to cover administrative overhead and profit.

Required:

- Determine Kim and Tim's bid for this job.
- How would the cost sheet change if Kim and Tim's explicitly allocated overhead to jobs? Assume that Tim and Kim apply overhead at the rate of 20% of materials cost and 50% of direct labor cost.

3.41 Allocation mechanics (LO5). Casey Corporation is organized into three divisions: Northwest, Midwest, and Southern. The firm has provided you with the following data, pertinent to allocating its annual corporate overhead cost of \$3,200,000.

	Northwest Division	Midwest Division	Southern Division	Total
Head count	250	300	250	800
Revenue	\$50,000,000	\$60,000,000	\$50,000,000	\$160,000,000
Profit	\$2,000,000	\$1,800,000	\$1,200,000	\$5,000,000

Required:

- Determine the overhead cost allocated to each division if Casey uses head count as the allocation basis. Repeat the exercise with revenue as the allocation basis and with profit as the allocation basis.
- Compare the costs allocated to the divisions under each of the three cost drivers. Why is the allocation using head count the same as the allocation using revenue? Why is the allocation using head count different from the allocation using profit?

3.42 Forming cost pools and choosing cost drivers (LO5). Alex, Mark, John, and Jason met during freshman orientation in college. They bonded almost instantly and became very good friends. During their junior year, they found a four-bedroom house for rent in a quiet residential neighborhood near their school. Alex found the house and signed the lease, fully anticipating that the others would be glad to room with him.

As the first person in, Alex chose for himself the only bedroom with an attached bath. Drawing straws for the other three rooms, Mark got the room with the best view and John got the largest room. The friends then started to figure out how they would handle the various expenses associated with living in a house. They wanted an equitable basis for allocating the rent and utilities (electricity, water, and cable TV; each has his own cell phone). In addition, they wanted to figure out a way to allocate food expenses as they anticipated cooking at home.

Required:

- Discuss three ways that the friends could allocate the rental cost among themselves. What are the costs and benefits of each method?
- Would you recommend that the friends choose different allocations for the different expenses? Justify your answers by indicating the change in the circumstances that triggers the need for a change in the allocation procedure.

PROBLEMS

3.43 Service firm, GAAP income statement (LO2).

Green Acres is a full-service lawn service. In addition to mowing, Green Acres provides a full array of seeding, aerating, and fertilizing services. The service has recently expanded to include pruning and related care of shrubs and trees. During the fall season, the service also rakes lawns, and does miscellaneous cleanup. Noticing that his trucks and rider mowers are idle during winter, Shawn, the owner, is contemplating whether to expand the service to include snow removal.

The following data pertain to operations for the most recent year.

Revenues from lawn mowing	\$525,200
Revenue from fertilizing services	\$640,000
Miscellaneous revenue	\$76,450
Beginning inventory of fertilizer and supplies	\$34,350
Purchases of fertilizer & supplies	\$395,400
Ending inventory of fertilizer and supplies	\$29,460
Depreciation of lawn mowing equipment	\$45,000
Equipment repair and maintenance	\$78,000
Fuel and other costs	\$54,000
Crew salaries	\$285,600
Office rent	\$82,000
Advertising	\$128,000
Accounting and payroll	\$45,000
Depreciation of Shawn's personal truck	\$4,000

Required:

Prepare a GAAP income statement. What detail would help increase the value of this statement?

3.44 Cost flows in merchandising (LO3).

The following data pertain to Natalie's Knick Knacks, a store that specializes in seasonal decorations, curios, and other collectibles.

Beginning inventory of goods	\$238,600
Purchases for the year	\$879,830
Ending inventory	\$178,450

Natalie typically prices items at a 100% markup. That is, if she paid \$30 for an item, she would price it at \$60. Of course, she does not expect to sell all items at the full markup. The following represents the pattern of sales in a typical year: 10% of her sales are at the full markup, 60% of sales are with a 25% discount off the list price, 20% at 50% off the list price, and 5% at 80% off the list price. The remainder (5%) represents unsold items, breakage, and so on.

Natalie also incurs \$136,800 towards the rental of her store, supplies (e.g., bags, tissue), utilities, and so on. She incurs \$64,500 toward salaries paid to her employees.

Required:

Prepare a GAAP income statement for the most recent year of operations.

3.45 Allocations in merchandising (LO3, LO5).

Serene Comfort sells a wide range of mattresses, beds, and other bedroom furniture. For the most recent year, they provide the following data:

Beginning inventory	\$2,450,000
Cost of purchases	23,125,000
Ending inventory	2,225,000
Transportation in	179,050

The firm informs you that it has traditionally written off the cost of transportation in to the cost of goods sold account. However, the firm has a new auditor this year. This auditor insists that the cost of transportation in, a product cost, should flow through the inventory account.

Required:

- a. Determine the cost of goods sold, ignoring the cost of transportation in.
- b. Allocate the cost of transportation in between ending inventory and cost of goods sold, using the account values as the allocation basis. The accountant informs you that there is no need to adjust the beginning inventory value for last year's values.
- c. What arguments could you make to justify the procedure in (b) as a reasonable way to deal with the accountant's objections? How, if at all, could you justify Serene Comfort's earlier action of writing off the entire amount to COGS?

3.46 Merchandising cost flows, two product lines (LO3). The Great Plains Cooperative Society (GPC) offers a wide range of gourmet foods (including organic foods) as well as an extensive selection of wine at its only store. To deal with rising costs and recent losses, as well as a major cash shortage, the cooperative store is planning to raise prices. The board has assembled the following data:

Gross sales	\$4,345,800
Cost of goods sold	3,524,600
Store staff salaries	235,320
Store rental & utilities	145,290
Other miscellaneous expenses	97,000

Digging deeper, you find the following additional data:

	<u>Wine</u>	<u>Groceries</u>
Beginning inventory	\$284,600	\$145,600
Ending inventory	395,340	128,900
Purchases	1,450,240	?
Sales	?	\$2,080,000

Moreover, you find that \$180,000 of the salaries are directly attributable to groceries and \$230,000 to the wine department. The remainder is for persons common to both departments. The store manager informs you that it is not meaningful to separate out the area devoted for wine separately as the aisles and displays are intermingled.

Required:

Prepare a brief memo to the board as background materials for the meeting. Be sure to include an income statement and possible solutions to the loss and cash crunch.



3.47 Allocations and cost flows (LO4, LO5). Amanda Corporation makes two kinds of hulls used to make speedboats. The regular hull is model R-750, and the deluxe model is D-800. For the year, Amanda furnishes you with the following information:

	<u>R-750</u>	<u>D-800</u>
Beginning inventory (WIP)	\$280,000	\$147,500
Raw materials used	690,000	545,000
Labor used	985,000	1,342,600
Cost of goods manufactured	2,250,000	2,346,900

You also learn that Amanda incurred \$1,358,500 in manufacturing overhead expenses during the year. Amanda allocates overhead to products using raw materials cost as the allocation basis. She does not distinguish between variable and fixed overhead.

Required:

Determine the value of the ending inventory of the two products.

3.48 Overhead charges and contractor pricing (LO1, LO5). Ly Tien believes that his remodeling contractor is overcharging him for materials. Specifically, Ly can get exactly the same item, sometimes even from the same store, for 20 to 30% less than what the contractor charges. Upon further investigation, Ly finds out that most skilled workers such as electricians and tile masons earn about \$15 to \$20 per hour. Yet, Ly's contractor bills out labor at \$30–\$45 per hour.

Required:

- What might explain the difference between the contractor's charge for materials and the price at the retail store? Would a similar rationale apply for labor costs as well?
- Contractors typically get 30 to 40% of the jobs that they bid on. Yet, many contractors will submit a bid free of charge, even though it may take them a full day's work to assemble a bid. What are the costs and benefits of asking the potential customer to pay for the work required to assemble a bid?

3.49 Unitized costs and decision making (LO5). The following is a product cost report for component A-103. The firm has received a bid to supply all needed units for \$32 per unit and must decide whether to accept the bid or continue making the product. The firm has sought your help in this decision, particularly because current capacity utilization is only 40% of available capacity. The firm will need the component for six more months; the new model of its product contains a redesigned component. The firm's accountant tells you that the decision to make or buy the component will not affect the firm's total outflow for fixed overhead costs.

Materials	\$12.00 per unit	
Direct labor	9.00	
Variable overhead	4.50	50% of labor cost
Fixed overhead	9.00	100% of labor cost
Total	\$34.50 per unit.	

Required:

Should the firm make or buy component A-103 for the next six months?

3.50 Allocated costs and decision making (LO5). "I was losing my shirt on field service calls. My consulting firm tells me that each call is costing me \$495! I have really cut back on the number of calls, and do not dispatch a technician unless the customer has called the office at least three times. Many times, the problem seems to solve itself, saving me nearly \$500!" This is Grace Daughtery's response to complaints from her salespeople that their firm is acquiring a reputation for poor after-sales service. Grace's firm sells process control systems used in manufacturing and maintains them under contract. Grace is the service manager for the Midwestern region.

Upon further inquiry, you discover that indirect costs account for a large proportion of the total costs connected with Grace's operations. Indirect costs include items such as the salaries of service technicians, facility rental, trucks, office maintenance, and the cost of storing spare parts. The consulting firm went through an extensive allocation exercise to drive these costs down to individual activities such as making a field service call.

Required:

Evaluate the wisdom of Grace's decision. In your answer, be sure to describe (1) how the consulting firm might have arrived at its estimate and (2) how, if at all, Grace should use the estimate for making effective decisions. (*Hint:* Be sure to consider the time horizon over which Grace's indirect costs would be controllable.)

3.51 Allocations and GAAP inventory valuation (LO4, LO5). Pringle and Company manufactures several kinds of canoes. This past year, Pringle spent \$11,750,000 on fixed manufacturing costs, \$1,762,500 on fixed selling and administrative costs, and \$23,500,000 on direct labor. Pringle produced 58,750 canoes and sold 55,000 during the year.

The following table provides the direct materials and labor costs for three of Pringle's canoes:

	<u>Model X-5</u>	<u>Model XV-10</u>	<u>Model XV-20</u>
Materials cost	\$100	\$175	\$300
Labor cost	\$300	\$400	\$700

Required:

- GAAP dictates that all manufacturing costs be included in product cost. Assume that Pringle allocates fixed costs using the number of units produced as the allocation basis. Under GAAP, what is the inventoriable cost per unit of each of the three canoes?
- Assume that Pringle allocates fixed costs using direct labor costs as the allocation basis. Under GAAP, what is the inventoriable cost per unit of each of the three canoes?
- Compare the answers to parts (a) and (b). Comment on any differences in inventoriable cost.

3.52 Unit costs and decisions (LO4, LO5). Sheridan Manufacturing provides the following data about its three products.

Product number	A-104	RJ-95	XL-435
Units per year	10,000	15,000	12,500
Machine hours/unit	2.5	2.6	3.25
Materials cost/unit	\$5.00	\$6.50	\$ 9.00
Labor cost/unit	\$7.50	\$9.60	\$12.40

You also know that the firm has \$39,000 in materials-related overhead, \$486,200 in labor-related overhead, and \$784,687.50 in machine-related overhead costs. The firm allocated materials- and labor-related overhead as a percentage of materials and labor costs, respectively. Machine hours are the allocation basis for machine related overhead.

Required:

- Determine the inventoriable cost per unit for each of the firm's three products.
- The firm's managers argue that the unit inventoriable cost is the floor for prices. After all, they say, the number even excludes controllable sales and administration costs. Do you agree?

3.53 Role of cost allocations, allocation mechanics (LO5). Hank, Bill, Dale, and Boomer are friends who live in northern Maine. Being frugal, they use wood-burning stoves in their homes to provide heating during winters. The friends harvest timber from land that Boomer owns. Each friend pays Boomer for the raw timber they consume at the prevailing market rate.

Each winter, the friends rent an industrial-strength hydraulic log-splitter to cut the timber into smaller logs that would fit a wood stove. Hank typically uses up 1/2 cord (the unit of measure for logs). Bill and Dale typically consume an entire cord. Boomer, who has a large house, splits 1.5 cords. Fully utilized, the log-splitter, which costs \$200 to rent for the day, could split five cords of wood per day. Hank, Bill, and Boomer split the majority of their own logs; however, the friends typically help Dale split his logs because he has a tendency to throw his back out when lifting the logs into the machine.

The friends use Bill's trailer to haul the log-splitter from the rental store and from house to house. At day's end, the friends accompany Bill to return the splitter to the rental store, after which they adjourn for some "refreshments" at a nearby bar.

Required:

- What costs would you allocate in this setting? Should Bill be compensated for the use of his trailer? Should the friends add the cost of helping Dale to the cost pool?
- Discuss two ways the friends could allocate the cost(s) you identified in part (a). What are the costs and benefits of each method?



3.54 Allocation mechanics, choice of driver (Challenging, LO5). Molded luggage is one of the main product lines for the Traveler Corporation. Traveler uses large molding machines to press a specially formulated chemical compound into metal molds corresponding to different suitcase sizes and shapes. The molded product is then trimmed, lined with fabric, and fitted with accessories such as locks and hinges before being packed and shipped.

The following data pertain to setting up one of the molding machines, which costs \$40,000 per year.

Product (Suitcase Type)	Number of Setups per Year	Hours per Setup	Total Number of Setup Hours for the Year
24" Two-suiter	7	14	98
26" Three-suiter	2	18	36
30" Jumbo Wheeler	1	26	26
Total	10	n/a	160

Required:

- Suppose Traveler allocates setup costs to products by using the number of setups as the allocation basis. What is the setup cost allocated to each product?
- Suppose Traveler allocates setup costs to products using the total number of setup hours as the allocation basis. What is the setup cost allocated to each product?

- c. Why do your answers for requirements (a) and (b) differ? What condition is necessary for the two answers to coincide?

3.55 Cost flows in not-for-profit organization (LO1, Advanced). Dollars for Scholars is a national organization that provides scholarships (usually \$500 to \$1,000 each) to qualified high school seniors pursuing higher education. The national organization sponsors independent local charities (e.g., Greater Coralville Dollars for Scholars, Clear Lake Dollars for Scholars). Each chapter raises its own money, decides on scholarships, and otherwise manages itself. Each chapter conducts a variety of programs (e.g., Battle of the Bands, Silent Auctions) to raise money.

The following data pertain to the Clear Lake DFS group for the most recent year.

Program receipts	\$25,459.93
Program costs	\$14,345.55
In kind donations (for programs)	2,450.00
Cash donations (not related to programs)	14,000.00
Interest income	2,396.48
Administration expenses:	
Office expenses	2,440.00
Postage and printing	845.00
Board meetings	143.50
Scholarships handed out	\$23,000.00
Beginning fund balance	\$47,500.00

Required:

Prepare financial statements that might be useful to the board of the Clear Lake DFS. (*Hint:* Consider preparing statements for program-related revenues and costs, sources and uses of funds, and a balance of funds.)

MINI-CASE

3.56 Cost flows and overhead application (LO4, LO5). Baber, Inc., manufactures custom scaffolding used in construction projects. The following data pertain to its operations for the most recent year:



Raw materials beginning inventory	\$23,000
Raw materials ending inventory	\$42,000
WIP beginning inventory	\$98,500
WIP ending inventory	\$76,400
Finished goods beginning inventory	\$124,350
Finished goods ending inventory	\$138,750
Raw materials purchased	\$190,000
Labor cost	\$145,000
Selling and administration expenses	\$87,600
Revenues	\$694,740

You also know that Baber, Inc., uses two allocation bases to charge overhead to products. It calculates a rate of 20% of materials cost for materials-related overhead. The rate for all other manufacturing overhead is 150% of labor cost.

Required:

- Calculate the cost of raw materials issued to WIP during the year.
- Calculate the cost of manufacturing overhead charged to production.
- Calculate the cost of goods manufactured during the year.
- Calculate the cost of goods sold during the year.
- Prepare a GAAP income statement.
- For a particular custom truss, Baber informs you that it incurred \$7,800 toward materials and \$12,300 toward labor costs. What is the inventoriable cost of this truss?
- Comment on whether the value of the units as reported in the ending inventory account is a good estimate of the products' costs for decisions such as setting pricing.

Module II

SHORT-TERM PLANNING AND CONTROL: MAXIMIZING CONTRIBUTION

In Chapter 1, you learned the Plan-Implement-Evaluate-Revise (PIER) cycle, which leads us to classify decisions as relating to *planning* or *control*. In Chapter 2, you learned that more costs and benefits become controllable as a decision's horizon increases, which leads us to classify decisions as *short term* or *long term*. Exhibit II.1 integrates these two ideas.

Like breaking down a large problem into manageable pieces, Exhibit II.1 groups business decisions to provide a systematic approach to decision making. *This exhibit provides the conceptual basis for organizing the remaining chapters in this book.* We classify decisions as short term or long term, and we discuss them in Modules 2 and 3, respectively. We cover planning decisions at the start of each module and control decisions at the end of each module.

ORGANIZATION OF MODULE II

We devote Module II (Chapters 4–8) to short-term decisions. For these decisions, organizations expect to realize most of the costs and benefits relatively quickly. Capacity costs, which arise from long-term commitments related to property, plant, equipment, and personnel, are not controllable over this horizon. These costs, which we often refer to as *fixed costs*, are therefore not relevant for short-term decisions. Accordingly, short-term decisions focus on getting

the most from available resources, as well as the efficient use of these resources.

In Chapter 3, you learned how accounting systems are designed to conform to GAAP and, as such, focus on distinguishing product costs from period costs. This focus, however, frequently is not useful for decision making because it mingles controllable costs with noncontrollable costs and fixed costs with variable costs. In Chapter 4, we show you how to modify the data from accounting systems to separate fixed costs from variable costs and controllable costs from non-controllable costs.

We devote Chapter 5 to Cost-Volume-Profit (CVP) analysis, a tool based on the linear relations among costs, volume, and profit. As you will learn, the CVP relation helps with short-term profit planning, evaluating short-term decision options, and assessing operating risk.

While the CVP relation is useful for many short-term decisions, it is not well suited for solving problems arising from temporary imbalances between the supply and demand for capacity resources. In Chapter 6, we discuss how to frame and solve such short-term decision problems. We examine several common contexts, including make-or-buy, accepting a special order, and allocating a scarce resource.

Chapter 7 examines operating budgets. Budgets incorporate planning decisions on how and where to

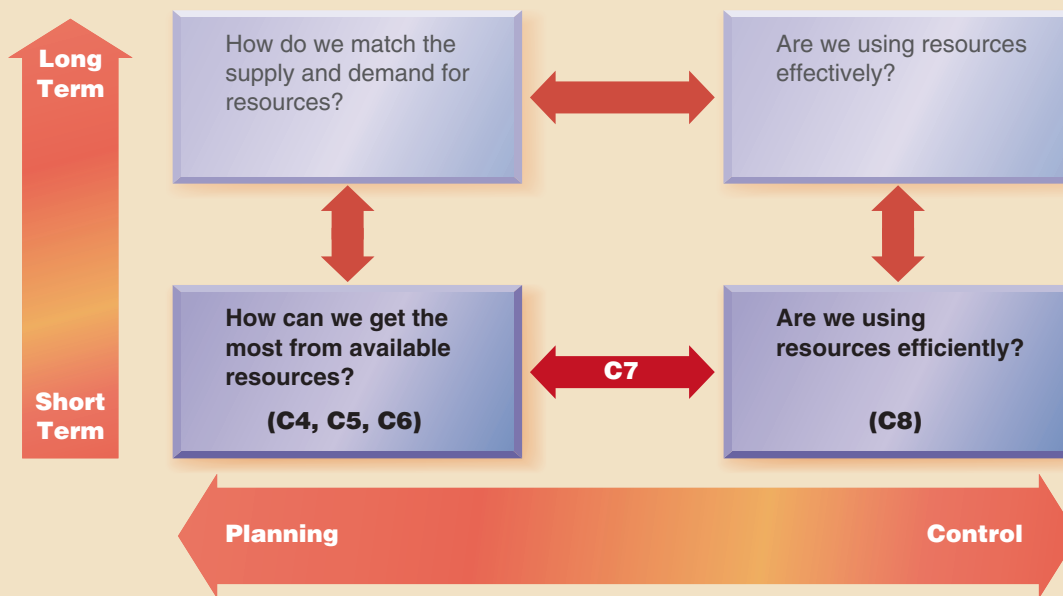


Exhibit II.1 Classifying decisions by time and planning/control provides a systematic approach to decision making.

deploy resources. Budgets also serve as the benchmark for evaluating actual results, a control decision. In this way, budgets bridge the planning and control dimensions. We underscore the tension between the planning and control roles for budgets in our discussion of both the mechanics of budgeting and the budgeting process.

The last chapter in the module, Chapter 8, focuses on short-term control decisions. We begin by introducing

the concept of a variance, which is the deviation between a budgeted and actual result. We then present the mechanics of variance analysis, with a focus on using variances to reconcile budgeted and actual profit. Finally, we emphasize the link back to planning decisions by discussing how to use variances to determine possible corrective actions.