After studying this chapter, you should be able to:

1. Understand the difficulty, yet importance, of having accurate product cost information.

2. Explain the flow of goods and services in a manufacturing organization and follow the corresponding accumulation of product costs in the accounting system.

3. Understand the process of accounting for overhead.

4. Create a Cost of Goods Manufactured schedule and understand how it is used to calculate cost of goods sold.

5. Explain the flow of goods and services in a merchandising organization and follow the corresponding accumulation of product costs in the accounting system.

6. Explain the flow of goods and services in a service organization and follow the corresponding accumulation of product costs in the accounting system.

7. Understand the impact of e-business on product costing.

8. Use the FIFO method to do process costing.
Before 1810, American business was basically made up of a loose collection of independent contractors, each focused on doing just one thing. As you can imagine, the wheels of commerce turned rather slowly. However, these small businesses were fairly easy to manage. They had few employees and simple processes. Cost accounting, if it existed at all, was not a difficult procedure. For example, if the wainwright wanted to know how much it cost to build a wagon for a customer, he simply added up the costs of buying lumber products from the sawmill, leather products from the tanner, and iron products from the blacksmith. He then set the price of the wagon high enough to compensate him for the time he spent assembling the materials.

The Industrial Revolution came to the United States with the mechanized, integrated cotton textile factories of New England. In 1814, at a cotton mill established by the American industrialist Francis Cabot Lowell in Waltham, Massachusetts, all the steps of an industrial process were combined under one roof for the first time. Instead of contracting with a dozen different little family-owned businesses to card, spin, and sew raw material into cloth, Lowell brought raw cotton fiber into a heavily equipped factory staffed with workers who were organized by specialty. In one massive facility, Lowell could take raw materials and create a finished product ready for sale. This was “big business,” and like all business innovations before and since, Lowell’s integrated production facility substantially complicated the accounting process. In order to run this textile mill, Lowell and his managers needed a reporting system that would provide the information to plan, control, and evaluate work they themselves could not personally oversee. History shows that the managers of these early textile mills developed a remarkably good accounting system that tracked inventory, payroll, and production work.

Shortly after the textile manufacturing industry was launched, the advent of railroads presented some of the most complex administrative problems of the nineteenth century. On May 10, 1869, the UNION PACIFIC RAILROAD from the East and the CENTRAL PACIFIC RAILROAD from the West were joined at Promontory Point, Utah. Railroad companies soon grew to sizes that dwarfed the scale of the largest textile factories, and the names of railroad tycoons like J. P. Morgan and Edward Henry Harriman became famous (or infamous, depending on your perspective). Managing these huge administrative entities required special record-keeping systems that captured enormous numbers of daily transactions and summarized essential information for frequent internal reports to management. The challenge for railroads was that employees and processes were literally spread all over the map! Senior managers needed some means of assessing the performance of station managers at terminals and yards across the country. Management accounting expanded as “costs per ton-mile” (the average cost to move a ton of material one mile) and “operating ratio” (a ratio of operating expenses to revenues) began providing competitive information to indicate how the performance of various station managers would affect the railroad’s total financial performance. These performance measures were used to delegate responsibilities and to control and evaluate the business from a distance, facilitating the spread of the railroads.

The last quarter of the nineteenth century brought an incredible outpouring of inexpensive, mass-produced goods and services for consumers, leading to the emergence of the mass merchandising industry composed of wholesalers and retailers. In addition to making many diverse items available for purchase from a single source, these wholesalers and retailers provided other critical services, including distribution, delivery, and extension of credit. Companies such as R. H. MACY & COMPANY, INC., in New York City and SEARS, ROEBUCK & COMPANY in Chicago were achieving tremendous financial success by focusing on a very important idea: move the inventory! The success of the mass merchant hinged on inventory turnover, called “stockturns.” By selling goods faster than smaller local merchants, large-scale wholesalers and retailers could charge lower prices and still realize tremendous profit. Up to this point, big business in America had focused almost exclusively on costs. But wholesalers and retailers introduced a new concept to management accounting. By controlling and evaluating the use of assets (in this case, inventory), merchandisers helped management accounting grow to include the process management technique of asset management (also known as capital management). As is described in the opening scenario for the chapter on managing inventory, this is a strategy that has been perfected in our day by WAL-MART.

inventory turnover (stockturns) The number of times the inventory in an organization “turns over” during a period of time. It is often easier to think of inventory turnover as the number of times a dollar invested in inventory is sold during a period of time. Inventory turnover is computed as cost of goods sold divided by average inventory value.

management accounting is the result of the efforts of many individuals and organizations to create information that has a competitive value in the marketplace. To really understand management accounting, you need to grasp how manufacturing, merchandising, and service organizations do business. Management accounting historically began with a focus on planning, controlling, and evaluating costs. Cost accounting continues to be a central facet of management accounting. In fact, understanding cost flows is a useful way to understand how a business is structured or organized. And although accurately determining the costs of products and services is difficult, it is one of the most important aspects of management accounting and provides one of the most useful pieces of information for business decision makers. Without accurate cost information, it is difficult to set appropriate prices, evaluate performance, reward employees, or make production decisions. It is even difficult to know whether a company should be competing in a specific market.

In this chapter, you will learn how goods and services flow in manufacturing, merchandising, and service companies and how product costs incurred in these organizations are tracked and accumulated. In subsequent chapters you will learn how to use product costs to manage and control manufacturing, merchandising, and service companies.

---

**Why Having Accurate Product Costs Is so Difficult, Yet Important**

Managers need accurate product cost information to plan for the future, to control current operations, and to evaluate past performance. They also need accurate product cost information so that they can deliver high-quality products to customers at the lowest price and at the fastest speed. For most companies, accurately determining product costs is a surprisingly difficult challenge. Regardless of the difficulty, however, having accurate product cost information is critical for a business. Without knowledge of accurate product costs, managers could easily over- or underprice products and make other poor decisions.

What if, for example, TOYOTA sells its 2003 Camry SE V-6 for $23,265 (its intended sales price), but the actual cost of producing the car is $26,000? How long could Toyota stay in business losing $2,735 ($26,000 − $23,265) per car? In this case, buyers will probably rush to buy Camrys because they will likely be priced much lower than other comparable cars (assuming TOYOTA’s competitors have more accurate cost information and have priced their cars to cover their total manufacturing costs). Not only will Toyota lose money on every car it sells, but the more cars TOYOTA sells, the greater its losses will be.

On the other hand, what if Toyota attempts to sell its Camry SE for $23,265, not realizing that its cost of making the car is actually only $15,000? If the accurate cost is only $15,000, other manufacturers, such as FORD, may sell their cars for much less than Toyota (assuming Ford has a better cost accounting system); sales of Camrys will dwindle. If Toyota mistakenly believes its costs are higher than $15,000, say, $22,500, it will not lower prices to the point where the company can compete with Ford and other manufacturers. The competitors that better understand their own costs will probably reduce prices, leaving TOYOTA behind in the market. With lower sales, TOYOTA may again lose money because it can’t sell enough cars to cover its fixed operating expenses. As you can see, having accurate product cost information helps managers in many ways, including making planning, controlling, and evaluating decisions such as the following:

---

**Toyota**


**Net Work:**

1. How much does the price increase if options package #1, a CD autochanger, a simulated maple dash, and a V.I.P. Plus security system are added?
2. How do these features affect Toyota’s manufacturing costs?
1. As part of the planning process, a company can determine whether it can or should compete in certain markets. It is possible that prices of competitors in some markets are already lower than the manufacturing costs would be for a new company trying to enter the market. For example, before starting a new airline, you should calculate whether the prevailing prices on the routes you intend to serve are high enough to cover the costs of the aircraft, air crew, ground crew, airport gate rental charges, regulatory approvals, ticketing system, and so forth.

2. When controlling operations, a company can analyze the relationship between production levels and costs and determine whether to increase, decrease, or stop production of certain products. For example, some MAJOR LEAGUE BASEBALL teams (the OAKLAND ATHLETICS are the prime example) have determined that some types of players (big-time free agents, glamorous closing relief pitchers, and highly-touted high school players are some examples) just cost too much to allow the team to make a profit with such players on the payroll. 2

3. In the evaluation process, a company can compare actual costs against budgeted costs (a management accounting process known as variance analysis that we’ll discuss later in a chapter on making decisions) and identify both progress and problems for subsequent management action. For example, when President Reagan initially proposed the construction of the International Space Station in 1984, the estimated cost was $8 billion. Recent estimates on the ultimate total cost of the project run as high as $90 billion, prompting some rather unfavorable “evaluation” of NASA.

Having accurate product cost information also allows a company to identify and eliminate costly, complicated processes so that higher-quality, lower-priced products and services can be delivered to customers in increasingly shorter cycle times. Accurate cost information allows management to determine the appropriate level at which to operate, to assess the long-term profitability of various products, and to manage the costs of production activities.

**Overhead: The Problem in Determining Accurate Product Costs**

You have learned in a previous chapter that costs of manufacturing products can be broken down into three elements: (1) direct materials, (2) direct labor, and (3) manufacturing overhead. Direct materials include the cost of raw materials that are used directly in the manufacture of products. Direct materials are kept in the raw materials warehouse until used and include such things as rubber used in making tires, steel used to make cars, wood used to make tables, and plastic used to make eyeglasses. Direct labor includes the cost of wages and benefits for assembly-line workers, but it does not include the wages and benefits of the factory custodians or the factory controller because, even though they work in the factory, they don’t work directly on making products. Manufacturing overhead includes all manufacturing costs that are not classified as direct materials or direct labor. This includes miscellaneous materials used in production, such as glue or nails; wages for the factory supervisor, controller, and custodians who work in the factory, but not directly on products; and other manufacturing costs such as utilities, depreciation of manufacturing facilities, insurance, and property taxes.

Although it is usually easy to assign direct materials and direct labor costs to specific products, it is extremely difficult to assign manufacturing costs, such as rent or the custodian’s salary, to specific manufactured products. Most manufacturing overhead costs are not related to the flow of production. For example, think about the cost of driving your car (if you have one) from your house or apartment to the nearest supermarket and back. It is unlikely that your tires will...

---

wear out or that you will need an engine overhaul or an oil change on this short trip. However, over the life of the car, you will spend substantial amounts of money on maintenance and repair costs. An extremely difficult accounting issue is computing how much of the overhead maintenance and repair cost should be included in the calculation of the cost of your short trip to the store and back. And this cost information is essential as you decide whether it is better to use your car or sell your car and ride a bicycle.

Companies face the same problem. They have insurance and tax bills that are part of manufacturing overhead costs that must be paid only once or twice a year. Utility costs, like heating and air conditioning in the plant, vary from month to month, sometimes significantly. The oc-

The Commercialization of the Internet  Who invented the Internet? The Internet began at the U.S. Department of Defense in the late 1950s at the direction of President Dwight D. Eisenhower. At the time of the Cold War and the Soviet Union’s successful launch of Sputnik, the Eisenhower administration felt the need for a network of computers between major U.S. cities so that the Department of Defense could easily connect with them. Soon major universities began to tap into the network. The timeline below shows the network’s origins and growth.

As early as 1988, pressure to commercialize the Internet began when businesses saw its potential as a means of communication and a way to create new marketplaces. Before the Internet could become commercial property, however, Congress had to enact new laws. A few years passed before the Internet was successfully commercialized. Then businesses jumped onto the “backbone” that the government had established and have since created a World Wide Web that enables businesses and consumers to enjoy the technology of the Internet that has been termed the “Technological Revolution” in business.

Like the Industrial Revolution, the Technological Revolution started with individuals who had a unique vision that eventually profited millions of people. For example, Barry Shein, a college dropout, created the first ISP (Internet service provider) in 1989. Barry’s idea stemmed from the “withdrawal” he felt when he no longer had Internet access after leaving his university. Soon after, giants such as AMERICA ONLINE (AOL), PRODIGY, and COMPUSERVE began reaping the benefits of Barry’s “withdrawal” symptoms. E-commerce on the Internet as we know it today is the result of the vision and efforts of many individuals such as Barry Shein. Without them, the explosive growth in e-commerce shown in the following graph would not have occurred. As a result, managers need to clearly understand the impact of commerce on business and accounting.


![Worldwide E-commerce Projected Sales Revenue Growth](http://www.forrester.com/ER/Research/Brief/0,1317,9229,00.html)
New Methods of Cost Accumulation

Many researchers and manufacturers have spent more time trying to determine ways to provide accurate product cost information than they have spent on any other management accounting topic. The result has been the introduction of several new product costing methods including activity-based costing (ABC). Advocates maintain that ABC can provide management with a more accurate assignment of overhead to products and, therefore, a better understanding of profitability. Because of these changes in management accounting and cost accumulation systems, many business organizations are currently in a state of transition. Companies such as DELUXE CORPORATION (the world’s largest printer of bank checks as well as a provider of electronic products and services to financial institutions) have completely restructured strategies and operations based on new cost accounting systems. Other companies have been slower to change and still use conventional cost accumulation systems. As a result, some companies struggle to compete effectively in their markets.

In view of the transitional state of accounting for product costs, we will cover both conventional product costing systems (in this chapter) and new cost accumulation systems (in later chapters). You need to understand both types of systems in order to facilitate organizational transitions to more competitive costing systems during your career. In the remainder of this chapter, we describe the conventional accumulation of product costs. The ABC concept will be defined and discussed in a later chapter.

FYI:
The very nature of the grocery business—selling perishable and dated products—makes inventory cost management crucial. One grocery food chain, HANNAFORD BROS., has implemented a new inventory management system that allows for quick and efficient communication between store managers and has saved several hundreds of thousands of dollars in paper reports, giving the company an important competitive advantage.


By integrating technology such as robotics into the production process, companies can reduce costs, improve quality, and increase productivity. However, technology also leads to significant changes in the types of costs companies must now manage.

TO SUMMARIZE: While it is difficult to exactly measure a product’s true cost, having accurate product cost information is extremely important. Without accurate costs, management can easily overprice or underprice products and make bad business decisions. Although it is usually easy to allocate direct material and direct labor costs to specific products, manufacturing overhead costs make accurate product costing difficult. New methods of cost accumulation, though challenging to implement, offer significant potential benefits to manufacturing, merchandising, and service companies. Hence, in order to be competitive in today’s economy, management needs accurate product cost information in order to plan for the future, control current operations, and evaluate past performance.

3 P. B. B. Turney, Deluxe Corporation: A Strategic Need for Activity-Based Costing (Charlottesville, Va.: University of Virginia Darden School Foundation, 1999).
The Flow of Goods and Costs in a Manufacturing Firm

2. Explain the flow of goods and services in a manufacturing organization and follow the corresponding accumulation of product costs in the accounting system.

It should be clear to you at this point that management accounting provides information with competitive value that supports management efforts to plan, control, and evaluate the organization’s performance in providing goods and services to the world. In addition, you know that organizations compete on the basis of costs, quality, and timeliness, and that management accounting needs to provide information regarding all three of these performance characteristics. As you read in the opening of this chapter, however, management accounting had its beginnings in tracking and reporting costs. Today, one of the best ways to understand how an organization works to provide goods and services is to “follow the money”; in other words, observe how costs flow through the organization. We’ll use cost flows to introduce you to manufacturing, merchandising, and service organizations. For a long time, manufacturing was the basis of the U.S. economy. Today, relative to other industries, manufacturing is much smaller. Nevertheless, management accounting systems were originally built to support the manufacturing process, so we’ll start there.

Consider the layout for a simple, hypothetical manufacturing company shown in Exhibit 1. This floor plan is for a manufacturer of furniture, Broyman Furniture Company. The floor plan...
shows a building that is partitioned into two sections. The administrative offices include office space for various vice presidents, the sales staff, the president, and the word-processing staff. The manufacturing facility encompasses the offices of the vice president of manufacturing, the plant manager, and the controller; the raw materials and finished goods warehouses; and the factory floor, where production takes place.

The manufacturing process for Broyman is quite straightforward. When purchased, raw materials are delivered to the raw materials inventory warehouse where they are stored until requisitioned for production. When requisitioned, raw materials are moved out onto the factory floor for the actual manufacturing process; there all material is referred to as work-in-process inventory until the process is completed. The factory floor includes three different manufacturing departments: cutting, machining, and finishing. Whereas some furniture products require work in all three areas, others may require work in only one or two areas. On the factory floor, factory employees combine materials with their labor to produce finished products. The finished products are then moved into the finished goods inventory warehouse and stored until sold.

Although the movement of goods through this simple factory is straightforward, tracking the costs of goods manufactured (the product costs) is not always so simple. You remember from the chapter that introduced management accounting that product costs include all costs necessary to create the product: essentially, the costs of all people and processes within Broyman’s manufacturing facility. On the other hand, the costs of people and processes in Broyman’s administrative offices, which are not associated with the production of furniture, are period costs. The basic idea that defines product costs is that these are the costs that can be associated with specific products. Certainly, the costs of the raw materials and the wages of factory employees who work on the factory floor are manufacturing costs that can be traced to specific products. But what about the salaries of the vice president of manufacturing, the plant manager, and the individuals working in the administrative offices? Should any part of their salaries be included in product costs? What about the utility bills to heat and light the building, the depreciation or rent on the building, the cost of the parking lot, the cost of paper towels for the washrooms, and other miscellaneous expenditures? Should any part of these expenses be included in manufacturing costs?

Because the individuals working in the administrative offices perform administrative and selling duties, rather than manufacturing functions, their salaries should probably not be classified as product costs. Likewise, the costs to pay for electricity, heat, and other expenses for the administrative offices are probably not manufacturing costs. However, the vice president of manufacturing and the plant manager perform functions related to manufacturing, so their salaries should probably be included as product costs. Although these employees perform administrative functions within the manufacturing facility, the work they perform cannot easily be identified with or assigned to specific products, unlike the factory employees who work directly on the products. Similarly, the heat, power, and depreciation related to the manufacturing facility should be included as manufacturing costs but cannot be easily traced to specific products. What about the costs of delivering purchased raw materials to the plant or the delivery of finished goods to customers? Should these delivery costs be classified as manufacturing, administrative, or selling expenses?

As you can see, accurately determining the costs of manufactured products can be challenging, even in a simple firm with one product and one location. When the “real world” introduces the complexities of multiple products being produced, changing prices and labor rates, multiple manufacturing locations (perhaps some international locations), and individuals performing multiple functions, etc., it becomes very challenging to accurately determine product costs. Essentially, in order to accurately measure product costs, management accountants must be able to:

1. Determine which costs relate to manufacturing and which relate to administrative and selling functions.
2. Accurately identify and measure all costs associated with manufacturing.
3. Determine appropriate ways to assign costs incurred to the individual products manufactured.

These issues are discussed in the following section.

**The Product Costing System**

Most accounting systems that track costs of producing and providing goods and services are based on a few key procedures.

- First, identify the product or project that needs cost measurement and track this project through the production process.\(^4\)
- Second, specifically trace the direct costs (costs of direct materials and direct labor) to each product or project.
- Finally, allocate an appropriate amount of overhead costs to each product or project.

This accounting approach is traditionally called **job order costing**. As we discuss the mechanics of this product costing system, keep in mind the overall procedure—identify the product or service (the “job”), trace the direct costs, and allocate the overhead. Also be sure to remember the big picture. In other words, why are we doing this? Product and service cost information is used to plan future operations (e.g., at what level of production should we operate?), to control current operations (e.g., are our costs too high?), and to evaluate performance (e.g., were our costs and performance last period good or bad?). This information is used by management to support continuous decisions about costs, quality, and time.

In our example, we will track product costs as we follow an order for a mahogany table that is manufactured by Broyman Furniture Company. The production of the table is a custom job requiring two operations: machining (preparing the mahogany) and finishing (assembling, staining, and packaging the table). (You will recall that there were three manufacturing areas in Exhibit 1. This table does not require work in the cutting department.)

Exhibit 2 shows that the mahogany table costs $393.50 to make. This amount includes $135 of direct materials, $134 of direct labor, and $124.50 of manufacturing overhead (which includes supervisor and production staff salaries, insurance, utilities, depreciation on plant and machinery, and so on). Looking at the cost summary in Exhibit 2, we can see that the hourly wage rate for direct labor is $10 per hour in machining and $12 per hour in finishing; the manufacturing overhead rate is $11 per machine hour in machining and $13 per direct labor hour in finishing. The **manufacturing overhead rate** is an estimate of the overhead that will be incurred for each unit (in this case, allocated on the basis of machine and direct labor hours). In this example, the company incurs an average of $11 of overhead for every hour the machine is run in the machining department. Thus, each table that requires the use of the machine is allocated a portion of the overhead costs. The use of different manufacturing overhead rates is common. Each department will allocate manufacturing overhead to products on the basis of the most meaningful activity in that department. (Remember the challenge discussed earlier of accurately estimating and allocating manufacturing overhead to products.) The machining department is more automated, so activity is tied more closely to machine hours; the finishing department requires more handwork, so activity is tied more closely to direct labor hours. With these “finished costs” in mind, let’s talk about how Broyman Furniture Company actually created these data on the mahogany table. But first, take a brief look at Exhibit 3 on page 125. In this rather complicated-looking exhibit you can literally “see” how the costs follow the

---

**job order costing** A method of product costing whereby each job, product, or batch of products is costed separately.

**manufacturing overhead rate** The rate at which manufacturing overhead is assigned to products; equals estimated manufacturing overhead for the period divided by the number of units of the activity base being used.

---

\(^4\) In some organizations, it is not reasonable or possible to specifically track the product being produced. For example, a lumber mill that continuously processes timber into planks may not specifically track individual products. Instead, the mill would track the total production costs expended for a particular period of time (e.g., a day), then assign those costs to the total amount of timber processed during that same period of time. This management accounting approach is called process costing and will be discussed in the expanded material section of this chapter.
production process and flow through the accounting system. We’ll work through the details of Exhibit 3 below. (Note: Don’t worry if you are still a little confused about how Broyman creates and uses manufacturing overhead rates. We’re going to discuss these concepts in detail later in this chapter.)

**Direct Materials Costs**
To illustrate the accounting for direct materials costs, we will assume that Broyman purchased a supply of mahogany and placed it in a materials storeroom. The entry to record this purchase is:

<table>
<thead>
<tr>
<th>Raw Materials Inventory</th>
<th>50,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounts Payable (or Cash)</td>
<td>50,000</td>
</tr>
</tbody>
</table>

*Purchased 25,000 board feet of mahogany at $2 per foot.*

When raw materials are needed (such as for the manufacture of the table), the machining department sends a request (i.e., a requisition) to the storeroom (usually via computer) identifying the quantity and type of materials needed. When the raw materials warehouse fills the requisition, it records the transfer of goods to the factory floor by making an entry (usually by

---

5 In this chapter, we will use an actual cost accounting system. We will discuss standard cost accounting systems later in the chapter on making decisions.
**Exhibit 3: Flow of Product Costs in Broyman Company Job Order Cost Accounting System**

### Journal Entries for Manufacturing Firms:

1. **Raw Materials Inventory**
   - Beg. Bal. 210,000
   - Accounts Payable (or Cash) 50,000
   - *Purchased raw materials.*

2. **Work-in-Process Inventory**
   - Beg. Bal. 1,250
   - Raw Materials Inventory 100
   - Raw Materials Inventory 35
   - *Used direct materials in production (includes materials used in both the machining and finishing departments).*

3. **Manufacturing Overhead**
   - Beg. Bal. 17,400
   - Raw Materials Inventory 15,000
   - *Used indirect materials in production (amount used during entire period).*

4. **Work-in-Process Inventory**
   - Beg. Bal. 1,250
   - Wages Payable 80
   - Wages Payable 54
   - *Incurred direct labor costs in the machining and finishing departments.*

5. **Manufacturing Overhead**
   - Beg. Bal. 1,250
   - Wages Payable 20,000
   - *Incurred indirect labor costs (includes indirect labor costs for entire period).*

6. **Manufacturing Overhead**
   - Accounts Payable 11,400
   - Rent Payable 6,450
   - Prepaid Insurance 850
   - *Incurred manufacturing overhead costs (includes amounts for entire period).*

7. **Work-in-Process Inventory**
   - Beg. Bal. 17,400
   - Manufacturing Overhead 393.50
   - *Applied manufacturing overhead from the machining and finishing departments to production.*

8. **Finished Goods Inventory**
   - Beg. Bal. 17,400
   - Finished Goods Inventory 393.50
   - *Completed production.*

9. **Cost of Goods Sold**
   - Finishing Goods Inventory 393.50
   - *Sold finished goods.*
computer) that serves as the basis for the accounting records. The storeroom manager sends the requisition information to the accounting department, where the unit cost is entered and the total cost calculated. The accounting entry made to record the transfer of mahogany from stor- 
age to machining is provided below. In addition, the finishing department requisitioned some packaging material to prepare mahogany tables for shipping.

<table>
<thead>
<tr>
<th>Work-in-Process Inventory</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Materials Inventory</td>
<td>100</td>
</tr>
<tr>
<td>Issued 50 board feet of mahogany to production at $2 per foot.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work-in-Process Inventory</th>
<th>35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Materials Inventory</td>
<td>35</td>
</tr>
<tr>
<td>Issued packaging material to production.</td>
<td></td>
</tr>
</tbody>
</table>

The mahogany and packaging material were used directly in the production and shipping preparation of the table; the cost is assigned as direct materials for this particular job. Because the amount of direct materials used varies proportionately with the level of production, direct materials are almost always variable costs. Indirect materials and supplies used in production (classified as manufacturing overhead costs), such as glue, nails, and varnish, are ordered from the storeroom in the same manner. Although some inexpensive materials, such as glue, are used directly in the manufactured products and others are used to support production, it is generally not cost-beneficial to trace such miscellaneous items to a particular job. These miscellaneous items are treated as indirect materials costs and recorded in the manufacturing overhead account (explained later in the chapter). Manufacturing overhead consists of numerous expenditures such as indirect labor, indirect materials, utilities, rent, and the like. The sum of these

---

**Costs and the Medical Profession** Have you ever gone to the doctor’s office, spent 20 minutes in the waiting room, then another 20 minutes in the examination room before the doctor comes in? When she finally comes in, she examines you for 10 minutes and then sends you on your way, charging you $85 for the visit. No wonder medical doctors make so much money—or do they? Does the doctor put your $85 right in her pocket?

What costs must your $85 cover? Unfortunately, you must help the doctor pay for office medical supplies, rent on the office, utilities, salaries of nurses and office personnel, fees charged by hospitals to use their facilities, and costs of training seminars to remain current in her field. While these costs are expensive, perhaps the most rapidly rising cost is for malpractice insurance. As an example, in many communities in the United States, the cost of obstetrical malpractice insurance is so high that some doctors will no longer deliver babies.

Where does the doctor get the money to cover these costs? By charging you $85 for your visit. Medicine is a business. The doctor is pricing patient visits to cover all costs incurred in providing that service. Costs must be covered and we, the consumers, must pay for them. The next time you visit the doctor, take a look around the waiting room, enjoy those pictures, and read those magazines. After all, you paid for them!
various expenditures provides the balance in the manufacturing overhead account. The following entry records the sum of all the requisitions for indirect materials for the period:

<table>
<thead>
<tr>
<th>Account</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing Overhead (indirect materials)</td>
<td>15,000</td>
</tr>
<tr>
<td>Raw Materials Inventory</td>
<td>15,000</td>
</tr>
</tbody>
</table>

Issued miscellaneous materials and supplies to the production floor.

At the end of a period, the amount of materials and supplies that remain on hand in the raw materials warehouse is shown on the balance sheet as Raw Materials Inventory.

**Direct Labor Costs**

The method of charging direct labor costs to production jobs is similar to that for direct materials costs. Most factories have a time clock where employees punch in and record their hourly activities. These time clocks often allow workers to identify specific jobs worked on. When the time clocks do not capture specific job information, the information is noted by making entries in the computer or on manual time tickets. The product costs, shown in Exhibit 2, reveal that machining employees worked on the mahogany table for 8 hours. Because the wage rate was $10 per hour in machining, the total direct labor cost in machining was $80 ($10 per hour \( \times 8 \) hours). Similar calculations provide the entry to record the direct labor costs in the finishing department. The entries to record all the direct labor costs (ignoring payroll taxes and benefits) for the mahogany table are:

<table>
<thead>
<tr>
<th>Account</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work-in-Process Inventory</td>
<td>80</td>
</tr>
<tr>
<td>Wages Payable</td>
<td>80</td>
</tr>
</tbody>
</table>

To record the machining department’s direct labor costs.

<table>
<thead>
<tr>
<th>Account</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work-in-Process Inventory</td>
<td>54</td>
</tr>
<tr>
<td>Wages Payable</td>
<td>54</td>
</tr>
</tbody>
</table>

To record the finishing department’s direct labor costs.

Remember that within certain limits, direct labor costs vary proportionately with the number of products made and, thus, are typically considered variable costs.

Like materials, labor costs can be either direct or indirect. Indirect labor costs include the wages of employees who perform functions not related to a specific job, such as maintenance and custodial. Usually, these employees still punch time clocks, but their wages become part of the indirect labor costs that are included in manufacturing overhead, as discussed in the next section. The following entry records the sum of all indirect labor for the period:

<table>
<thead>
<tr>
<th>Account</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing Overhead (indirect labor)</td>
<td>20,000</td>
</tr>
<tr>
<td>Wages Payable</td>
<td>20,000</td>
</tr>
</tbody>
</table>

To record indirect labor costs.

**Manufacturing Overhead Costs**

In contrast to direct materials and direct labor, manufacturing overhead (the third type of product cost) involves more complex accounting procedures and estimation problems. As we’ve discussed earlier, usually direct materials and direct labor can be readily assigned to specific jobs or products. However, manufacturing overhead costs are difficult to trace directly to the production of a single item and must often be estimated in advance of their incurrence. By definition, most manufacturing overhead costs benefit all products made in a department or a
company during a period. The depreciation on equipment and the wages paid for maintenance in the machining department, for example, ensure the smooth operation of the entire department for the period; however, these costs cannot be traced directly to individual items produced during the period. Some manufacturing overhead costs, such as property taxes and repairs, are not known until the end of an accounting period. However, managers need current product cost information (for pricing similar jobs, estimating costs for next year, and so forth), so each job is assigned a share of estimated (i.e., budgeted) manufacturing overhead costs. In accounting terminology, manufacturing overhead costs are applied to (or absorbed by) jobs or products. Overall, knowing how to set up and handle the accounting for overhead costs at Broyman Company is a tricky business, which we’ll talk further about later in this chapter.

For now, as actual manufacturing overhead costs for Broyman are incurred, the management accounting system needs to recognize and record the costs. During the current production period, these costs include $1,200 for repairs to equipment, $6,450 for monthly rent allocated to the production facility, $850 for liability insurance, and $2,900 in depreciation of manufacturing equipment. The total of these costs is debited to Manufacturing Overhead, and the individual amounts are credited to their respective accounts, as shown here.

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing Overhead</td>
<td>11,400</td>
</tr>
<tr>
<td>Accounts Payable</td>
<td>1,200</td>
</tr>
<tr>
<td>Rent Payable</td>
<td>6,450</td>
</tr>
<tr>
<td>Prepaid Insurance</td>
<td>850</td>
</tr>
<tr>
<td>Accumulated Depreciation</td>
<td>2,900</td>
</tr>
</tbody>
</table>

To record actual manufacturing overhead costs.

In addition to recording the actual costs of manufacturing overhead, Broyman’s accountants need to allocate overhead costs to the mahogany table in production. As you can see in Exhibit 2, the Broyman management accountants follow a traditional approach of assigning manufacturing overhead costs by taking the expected annual costs of overhead for each department and dividing this estimated amount by the selected activity base (in this case, machine hours for the machining department and direct labor hours for the finishing department). Estimated overhead costs typically come from the company’s annual budgets. Selection of the activity base is the result of experience and analysis. The result is an allocation rate for each department that is used to uniformly assign a “fair share” of manufacturing overhead costs to production volume throughout the year. This allocation rate is called the predetermined overhead rate. In this case, Broyman’s accountants allocate to the mahogany table $66 based on activity in the machining department ($11 predetermined overhead rate × 6 machine hours) and $58.50 based on activity in the finishing department ($13 rate × 4.5 direct labor hours). The entries to record these allocations are:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work-in-Process Inventory</td>
<td>66.00</td>
</tr>
<tr>
<td>Manufacturing Overhead</td>
<td>66.00</td>
</tr>
</tbody>
</table>

To apply manufacturing overhead from the machining department.

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work-in-Process Inventory</td>
<td>58.50</td>
</tr>
<tr>
<td>Manufacturing Overhead</td>
<td>58.50</td>
</tr>
</tbody>
</table>

To apply manufacturing overhead from the finishing department.
Notice in Exhibit 3 that as actual overhead costs are incurred (as with indirect materials and indirect labor), the manufacturing overhead account is debited. As overhead costs are applied to products, the manufacturing overhead account is credited. This relationship is better illustrated and discussed later in this chapter.

Transferring the Costs of Completed Jobs and Computing Unit Costs

While a job is in process, the costs of direct materials, direct labor, and manufacturing overhead are accounted for separately. When the job is completed, however, these costs (in total) are transferred from Work-in-Process Inventory to Finished Goods Inventory. In the Broyman Furniture Company example, the total cost assigned to the mahogany table is $393.50, as illustrated in Exhibit 2. The entry to transfer the completed cost of the table to Finished Goods Inventory is:

\[
\begin{align*}
\text{Finished Goods Inventory} & \quad 393.50 \\
\text{Work-in-Process Inventory} & \quad 393.50 \\
\end{align*}
\]

To record the completion of the mahogany table.

It’s important that you now take a moment to compare Exhibits 1 and 3. Can you see that how the flow of costs through the accounts in Exhibit 3 closely resembles how the product is created and moves through the manufacturing facility in Exhibit 1? The product costs assigned to the table literally follow that table as it moves through the factory floor (and through the work-in-process inventory account) until the table is completed and moves into the finished goods warehouse (and into the finished goods inventory account). Once completed, cost data for the mahogany table are used in pricing similar jobs, estimating costs for the next year, and measuring income. Note that this process would be no different if, instead of a single table, Broyman were to identify and cost an entire batch of mahogany tables. In this case, at the completion of the job, the unit cost of each table is computed by adding the direct materials, direct labor, and manufacturing overhead costs for the batch and dividing the total by the number of tables produced in the batch (i.e., the job).

Transferring the Costs of Products That Are Sold

When a product is sold, the costs assigned to it are transferred to Cost of Goods Sold. For example, when the mahogany table, which cost $393.50 to make, is shipped to a customer, the table is loaded from the warehouse onto the truck, and the cost of the table is transferred from Finished Goods Inventory to Cost of Goods Sold, using the following entry:

\[
\begin{align*}
\text{Cost of Goods Sold} & \quad 393.50 \\
\text{Finished Goods Inventory} & \quad 393.50 \\
\end{align*}
\]

To record the cost of goods sold for the mahogany table.

With this entry, costs have been traced all the way through the production cycle and expensed onto the income statement. Once again, inspect Exhibit 3 and be sure that you can clearly see how all the costs flow through the manufacturing process for Broyman. Note that direct labor, when incurred, and raw materials, when used, are debited directly to Work-in-Process Inventory. Actual manufacturing overhead costs, on the other hand, are entered first as debits to Manufacturing Overhead and then are allocated to Work-in-Process Inventory by crediting Manufacturing Overhead. Be careful to note that in Exhibit 3, entry 1 is for mahogany that will be used on several jobs; entries 3, 5, and 6 are actual manufacturing costs.
incurred for the entire accounting period in which the table was manufactured. Entries 2, 4, 7, 8, and 9 are entries specifically associated with the mahogany table in our example. At the end of the period, the company will usually have three inventory balances: Raw Materials Inventory, Work-in-Process Inventory, and Finished Goods Inventory.

**TO SUMMARIZE:** In traditional job order cost accounting systems for manufacturing organizations where a specific product can be identified, all direct labor, direct materials, and manufacturing overhead costs are accumulated for each unit or batch (generally referred to as a job). Because the exact amount of manufacturing overhead cannot be determined until the accounting period is completed, an estimated amount of manufacturing overhead is applied to jobs. To estimate the amount of manufacturing overhead to be applied to a job, a predetermined overhead rate is calculated for each department involved in production, using an appropriate measure of activity. This rate is multiplied by the actual quantity of the activity used to complete the job. Total costs for completed jobs are then transferred from Work-in-Process Inventory to Finished Goods Inventory. When manufactured goods are sold, costs are transferred from Finished Goods Inventory to Cost of Goods Sold.

**Accounting For Overhead**

3 Understand the process of accounting for overhead.

In the Broyman Company example of producing a mahogany table and tracking its production costs, you can see that accounting for manufacturing overhead costs is not the same process as accounting for direct materials and direct labor costs. Because manufacturing overhead costs generally do not coincide with the flow of production, a few extra steps are required to handle the accounting. These steps are:

1. Before the year begins, budget the estimated manufacturing overhead, estimate the allocation activity, and establish the predetermined overhead rate.
2. During the year, as costs are incurred, record actual manufacturing overhead as debits to the manufacturing overhead account.
3. During the year, as activity takes place, record applied manufacturing overhead as credits to the manufacturing overhead account and debits to the work-in-process account.
4. At the end of the year, compare actual and applied overhead balances and close out the difference in the manufacturing overhead account.

**Estimated Manufacturing Overhead**

As you can see, the list above includes three difference classifications of manufacturing overhead costs—estimated, actual, and applied. It is critical that you understand the differences among these numbers. Estimated manufacturing overhead is the amount of overhead costs that management has budgeted for the upcoming production period. The predetermined overhead rate is created by dividing estimated manufacturing overhead by the estimate of the expected level of activity (e.g., direct labor hours) to be used to allocrate overhead during the year.

To illustrate the use of estimated manufacturing overhead to create the predetermined overhead rate for the machining department at Broyman Company, assume that at the beginning of the year the accountants and production personnel estimated that 24,500 machine hours would be used on the factory floor. Budgeted (estimated) overhead costs for the machining department are shown below. Note that these costs have been separated into fixed and variable components.

<table>
<thead>
<tr>
<th>Variable manufacturing overhead:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect labor</td>
<td>$ 45,000</td>
</tr>
<tr>
<td>Indirect materials</td>
<td>15,000</td>
</tr>
<tr>
<td>Repairs</td>
<td>7,500</td>
</tr>
<tr>
<td></td>
<td>$ 67,500</td>
</tr>
</tbody>
</table>
Fixed manufacturing overhead:
- Rent .......................................................... $105,000
- Depreciation .................................................. 85,000
- Insurance ...................................................... 12,000

Total expected manufacturing overhead cost for the year (machining department) ........................................... $269,500

Using these data, the accountants then computed the predetermined overhead rate in the machining department to be $11 per machine hour, as follows:

\[
\text{Total estimated manufacturing overhead cost for the year} = 269,500 \\
\text{Total estimated machine hours} = 24,500 \\
\text{Predetermined overhead rate} = \frac{269,500}{24,500} = 11 \text{ per machine hour}
\]

Similar calculations were used to calculate the predetermined overhead rate of $13 per direct labor hour in the finishing department.

**Actual Manufacturing Overhead**

After studying financial accounting, some students have a difficult time with the accounting for actual manufacturing overhead. For example, in financial accounting, we accounted for salaries by debiting Salaries Expense and crediting Salaries Payable, which is the correct entry when the salaries are for sales or other nonmanufacturing personnel. However, as you saw in tracking production costs for Broyman’s mahogany table, when the wages are related to manufacturing, the debit is to Work-in-Process Inventory for direct labor and to Manufacturing Overhead for indirect labor. Thus, in management accounting, it is important to determine first whether salaries are for manufacturing or for nonmanufacturing personnel. Then, for manufacturing personnel, it must be determined whether the individuals worked directly on the product (Work-in-Process Inventory) or indirectly on the product (Manufacturing Overhead). The same is true for other costs such as depreciation and rent. If these costs relate to manufacturing, they are debited to Manufacturing Overhead; costs not related to manufacturing are debited to Depreciation Expense, Rent Expense, and so forth. The manufacturing costs will eventually become expenses when the products are sold (Cost of Goods Sold).

**Applied Manufacturing Overhead**

It is important to understand that the debit side of the manufacturing overhead account is used to record actual overhead expenses. Conversely, the credit side of this account is used to record applied manufacturing overhead that is simultaneously debited to the work-in-process inventory account, as illustrated in Exhibit 4. In essence, this entry transfers the overhead cost from the temporary holding account called Manufacturing Overhead to the asset account called Work-in-Process Inventory.

Actual costs, including actual manufacturing overhead costs, are needed for accurate reporting of annual income and for computing a company’s income tax liability at the end of the
year. However, the management process of controlling and evaluating costs and setting prices cannot wait until the end of the year. Hence, while both actual and applied manufacturing overhead costs are accounted for constantly throughout the year, actual overhead costs are too sporadic to be effectively used for pricing and costing decisions that take place continuously. For this reason, predetermined overhead rates are used to apply overhead throughout the year.

Disposion of Over- and Underapplied Manufacturing Overhead

If the beginning-of-the-year estimates of both manufacturing overhead costs and the activity basis (e.g., machine hours) are perfect, then at the end of the year the accountants at the Broymann Company will have applied as much overhead to Work-in-Process as was actually incurred, and the ending balance in the manufacturing overhead account will be $0 (this rarely happens). Typically, though, the ending balance in the manufacturing overhead account is not very large. Nevertheless, the manufacturing overhead account is a temporary account that must be closed out at the end of the year. Handling any balance left in Manufacturing Overhead is the process of disposing of over- and underapplied manufacturing overhead.

Note in Exhibit 3 that a total of $46,400 in actual costs have been debited to the manufacturing overhead account. To illustrate the accounting for the difference between actual and applied manufacturing overhead costs, we will assume that these costs represent the total actual manufacturing overhead for March 2006. Further, including the work done on the mahogany table in our example, the machining department at Broymann used a total of 1,600 machine hours and applied $17,600 to Work-in-Process Inventory, and the finishing department employed 1,250 direct labor hours and applied $16,250. Finally, the cutting department (using a similar overhead allocation procedure) applied $11,800. At the end of March, the manufacturing overhead account would appear as follows.

<table>
<thead>
<tr>
<th></th>
<th>(Actual costs)</th>
<th>(Applied costs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20,000</td>
<td>17,600 applied in machining department</td>
</tr>
<tr>
<td></td>
<td>15,000</td>
<td>16,250 applied in finishing department</td>
</tr>
<tr>
<td></td>
<td>11,400</td>
<td>11,800 applied in cutting department</td>
</tr>
<tr>
<td></td>
<td>46,400</td>
<td>45,650</td>
</tr>
<tr>
<td></td>
<td></td>
<td>750 balance (underapplied)</td>
</tr>
</tbody>
</table>

A comparison of the debit and credit sides of the manufacturing overhead account shows that actual manufacturing overhead costs incurred were $750 higher than applied costs (which indicates that overhead was underapplied for the month). This difference is usually ignored until year-end because management is concerned with immediate decisions, for which current estimates are adequate. At year-end, however, this difference must be accounted for, not only to balance the books, but also to show actual costs in measuring income.

If, at the end of the year, total actual manufacturing overhead is less than the amount applied, the account will have a credit balance. This result is referred to as overapplied manufacturing overhead. Conversely, if applied manufacturing overhead is less than actual costs, the account will have a debit balance representing underapplied manufacturing overhead.

Which is better to have at the end of the year—under- or overapplied overhead? If overhead is underapplied, then the total cost of jobs will be understated. If a company were to price its products in the future based on this understated cost, the company could lose money because it might not cover its actual manufacturing overhead costs. On the other hand, overapplied manufacturing overhead indicates that jobs were overcharged for overhead and costs were overstated. If future pricing decisions were made based on these overstated costs, the company would soon find customers looking elsewhere for more reasonably priced products. Neither
under- nor overapplied overhead is desirable. A company’s objective is to attempt to anticipate overhead costs and accurately charge those costs to the various jobs.

There are two methods of treating over- and underapplied manufacturing overhead in the accounting system:

1. Close over- or underapplied manufacturing overhead directly to Cost of Goods Sold.
2. Allocate over- or underapplied manufacturing overhead to Work-in-Process Inventory, Finished Goods Inventory, and Costs of Goods Sold on the basis of the ending balances in these three accounts.

The first method is easier and more commonly used, especially if the over- or underapplied amount is small, because it requires only a single entry to correct the amount of manufacturing overhead applied. Let’s assume that at year-end, when total actual and applied manufacturing overhead have been recorded, manufacturing overhead for Broyman was overapplied by $1,900. The entry to assign this overapplied manufacturing overhead to Cost of Goods Sold would be:

\[
\begin{align*}
\text{Manufacturing Overhead} & \quad 1,900 \\
\text{Cost of Goods Sold} & \quad 1,900 \\
\end{align*}
\]

*To recognize the excess of applied manufacturing overhead costs over actual manufacturing overhead.*

*Note: The entries for underapplied manufacturing overhead would be opposite from what is shown above—debit Cost of Goods Sold and credit Manufacturing Overhead.*

This entry will decrease the cost of goods sold account for the year by $1,900 and will close out the manufacturing overhead account. Companies that have very small or zero inventory balances would normally charge any over- or underapplied overhead to Cost of Goods Sold.

The second method is more accurate because, theoretically, any difference between applied and actual manufacturing overhead should be allocated proportionately to all items in production during the period. The items in production include those produced and sold (Cost of Goods Sold), those produced and not sold (Finished Goods Inventory), and those still being produced (Work-in-Process Inventory). If the estimate had been accurate, manufacturing overhead costs would have been allocated proportionately to all products. Therefore, those products actually sold should not be burdened with, or relieved of, the entire amount of the estimation error. This alternative is more complicated, however, and requires detailed calculations and several journal entries, so it will not be illustrated here. When differences between actual and applied overhead are small, this more accurate method is usually not worth the extra effort.

**TO SUMMARIZE:** Actual manufacturing overhead costs are accumulated and debited to Manufacturing Overhead throughout the year. Applied (or estimated) manufacturing overhead costs are assigned to jobs on the basis of a predetermined overhead rate. These costs are credited to Manufacturing Overhead and debited to Work-in-Process Inventory. Any difference between actual and applied manufacturing overhead at the end of the period must be accounted for in order to properly measure income. When total actual manufacturing overhead exceeds total applied overhead, the excess is referred to as underapplied manufacturing overhead. When total applied overhead exceeds total actual overhead, the excess is referred to as overapplied manufacturing overhead. The easiest and most commonly used method of eliminating over- or underapplied manufacturing overhead is to transfer it directly to Cost of Goods Sold. In some cases, the over- or underapplied manufacturing overhead is allocated among Work-in-Process Inventory, Finished Goods Inventory, and Cost of Goods Sold to arrive at a more accurate assignment of costs.
The Cost of Goods Manufactured Schedule

In this section we will examine a single report, the Cost of Goods Manufactured schedule, that summarizes the cost flows in a manufacturing organization during a given period. We will also see how this cost information is used to then compute cost of goods sold.

Be sure that you review Exhibit 3 and see again how manufacturing costs (materials, labor, and overhead) are accumulated in the work-in-process inventory account, then flow to Finished Goods Inventory, and finally to the cost of goods sold account. These cost flows are summarized on a Cost of Goods Manufactured schedule, which supports the cost of goods sold calculation on the income statement.

The purpose of the Cost of Goods Manufactured schedule is to report the total costs that have been incurred to manufacture goods during a period. In our example, Exhibit 5 shows the Cost of Goods Manufactured schedule for Broyman Furniture Company. You will note that the numbers used in Exhibit 5 cannot be specifically traced back to Exhibit 3. This is because the costs flowing through the accounts in Exhibit 3 are focused on the cost associated with the manufacture of a single table. Conversely, the costs in Exhibit 5 are for an entire year. The important thing for you to focus on in Exhibit 5 is the format for summarizing and reporting manufacturing cost flows. Note how the calculation for raw materials used in production is actually based on using the raw materials inventory account to calculate (or “plug”) the number that flows into the work-in-process account as shown below.

<table>
<thead>
<tr>
<th>Raw Materials Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Balance</td>
</tr>
<tr>
<td>Purchases</td>
</tr>
<tr>
<td>Ending Balance</td>
</tr>
</tbody>
</table>

Exhibit 5: Cost of Goods Manufactured Schedule

<table>
<thead>
<tr>
<th>Broyman Furniture Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of Goods Manufactured Schedule</td>
</tr>
<tr>
<td>For the Year Ended December 31, 2006</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Raw materials:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning raw materials inventory</td>
</tr>
<tr>
<td>Add: Raw materials purchased</td>
</tr>
<tr>
<td>Total raw materials available</td>
</tr>
<tr>
<td>Less: Ending raw materials inventory</td>
</tr>
<tr>
<td>Raw materials used in production</td>
</tr>
<tr>
<td>Direct labor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manufacturing overhead:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect labor</td>
</tr>
<tr>
<td>Utilities</td>
</tr>
<tr>
<td>Rent</td>
</tr>
<tr>
<td>Depreciation</td>
</tr>
<tr>
<td>Indirect materials</td>
</tr>
<tr>
<td>Insurance</td>
</tr>
<tr>
<td>Total actual manufacturing overhead</td>
</tr>
<tr>
<td>Add: Overapplied manufacturing overhead</td>
</tr>
<tr>
<td>Applied manufacturing overhead</td>
</tr>
<tr>
<td>Total manufacturing costs</td>
</tr>
<tr>
<td>Add: Beginning work-in-process inventory</td>
</tr>
<tr>
<td>Less: Ending work-in-process inventory</td>
</tr>
<tr>
<td>Cost of goods manufactured</td>
</tr>
</tbody>
</table>
The Cost of Goods Manufactured schedule provides the calculations that support the flow of costs for a manufacturing firm. In our example, the schedule shows that materials costing $290,000 were combined with direct labor costs of $300,000 and applied manufacturing overhead costs of $174,000 to transfer $764,000 of manufacturing costs to Work-in-Process Inventory. This $764,000 amount of total manufacturing costs represents the new manufacturing costs incurred during the period and is a good representation of the level of production activity carried out during the period. The $764,000 was then adjusted for the beginning and ending work-in-process inventories to determine the $774,000 cost of goods manufactured for the period. The amount of cost of goods manufactured represents the total cost of items for which production was completed during the period; this cost includes some costs incurred in prior periods (from beginning work-in-process inventory) and most costs incurred during this period. Effectively, cost of goods manufactured represents the flow of costs out of the work-in-process account as shown below.

<table>
<thead>
<tr>
<th>Work-in-Process Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Balance</td>
</tr>
<tr>
<td>Direct Materials Costs</td>
</tr>
<tr>
<td>Direct Labor Costs</td>
</tr>
<tr>
<td>Applied Manuf. Overhead Costs</td>
</tr>
<tr>
<td>Ending Balance</td>
</tr>
</tbody>
</table>

Note that the cost of goods manufactured number of $774,000 is based on applied manufacturing overhead costs (not actual overhead costs). However, the actual manufacturing overhead costs are reported in the Cost of Goods Manufactured schedule in Exhibit 5. The reason for this is to provide useful information for purposes of management planning, control, and evaluation. Overapplied manufacturing overhead is then added to the actual overhead costs in order to adjust these costs to applied manufacturing overhead for the calculation of cost of goods manufactured.

Knowing the total cost of goods manufactured makes it easy to determine the total cost of goods sold. The cost of goods manufactured amount is added to beginning finished goods inventory (assume $60,000) and adjusted for any over- or underapplied manufacturing overhead (assume $6,000 overapplied) to arrive at cost of goods available for sale of $828,000. The ending finished goods inventory (assume $40,000) is then subtracted to determine the cost of goods sold ($788,000). This calculation of cost of goods sold is shown below.

<table>
<thead>
<tr>
<th>Cost of Goods Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning finished goods inventory</td>
</tr>
<tr>
<td>Add: Cost of goods manufactured</td>
</tr>
<tr>
<td>Cost of goods available for sale</td>
</tr>
<tr>
<td>Less: Ending finished goods inventory</td>
</tr>
<tr>
<td>Unadjusted cost of goods sold</td>
</tr>
<tr>
<td>Less: Overapplied manufacturing overhead</td>
</tr>
<tr>
<td>Adjusted cost of goods sold</td>
</tr>
</tbody>
</table>

This calculation can also be shown using the finished goods inventory and cost of goods sold accounts as shown below.

<table>
<thead>
<tr>
<th>Finished Goods Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Balance</td>
</tr>
<tr>
<td>Cost of Goods Manufactured</td>
</tr>
<tr>
<td>Ending Balance</td>
</tr>
</tbody>
</table>
The Flow of Goods and Costs in a Merchandising Firm

5 Explain the flow of goods and services in a merchandising organization and follow the corresponding accumulation of product costs in the accounting system.

channel The distribution line that a product travels from the original manufacturer to the eventual end-user customer. The channel is typically composed of a manufacturer, a wholesaler, a retailer, and the end-user customer.

Retailing is the most visible component of our economic system. Nevertheless, we probably fail to appreciate that what happens over that last three feet of counter in the store is the culmination of the efforts of a great industrial machine and the related mass distribution system. Similar to the concept of an ecosystem in nature, manufacturers, wholesalers, and retailers are linked together in an economic system called a channel. If retailers cannot move goods and services the last three feet into the hands of those who will use them, the whole distribution system of manufacturing, wholesaling, and retailing falls apart.

The Distribution Channel

Exhibit 6 illustrates the channel system that typically interrelates manufacturers, wholesalers, and retailers. We’ve discussed manufacturing operations (the starting point of the channel) and the related management accounting systems. In order to understand the full cycle of business, we now discuss the process of distributing goods to customers. As you can see in Exhibit 6, the existence of wholesale middlemen in the distribution channel does not prevent retailers from occasionally dealing directly with manufacturers. For example, WAL-MART is noted for its
ability to use technology to make direct contact with manufacturers to obtain a significant number of its inventory items. Similarly, some manufacturers may handle some (or even all) of their distribution to retailers. HONDA and FORD, as an example, work directly with their car dealerships and bypass the wholesalers to distribute their products directly to retailers. Finally, a limited number of manufacturers, particularly small manufacturers, have direct relationships with the ultimate end-user customers of their products. They do this by setting up the well-known factory outlet store or by allowing customers to order directly from them; these direct sales are increasingly being done through the Web. A good example of this particular distribution approach is DELL COMPUTER CORPORATION. Dell is one of several large personal computer manufacturers in the United States that take orders directly from end-user customers, build computers to customer specifications, and then ship the finished computers directly to the customers.

Some people argue that the presence of middlemen simply adds to the cost of getting products from manufacturers to consumers. In some cases, this is true. The furniture store probably adds to the consumer’s cost of buying a rocking chair from our example manufacturer, the Broyman Furniture Company. But the reality is that most customers cannot buy directly from furniture manufacturers. Further, Broyman may not be interested in (nor equipped for) dealing directly with its many customers! Similarly, many retailers (such as your local grocery store) are not in a position to deal directly with the manufacturers of the items they sell to the public. In addition, wholesalers may be able to provide the retailer such things as next-day delivery, unlimited returns, expert advice on merchandise selection, and customized product mix. If the cost of using a wholesaler is less than the cost to the retailers of providing these services for themselves, then the use of a middleman makes good economic sense. Hence, in providing important options, services, and convenience, wholesalers and retailers can actually add to the efficiency of the distribution system and decrease costs for the ultimate consumer. Management
accountants help merchandising companies carefully manage the costs of obtaining and distributing inventory. If costs become too high, then the merchant’s customers may either go to a competitor to obtain the goods or skip over the middleman to negotiate directly with the supplier.

**Inventory Flow in the Distribution Channel**

Spend a few minutes studying Exhibit 7. This exhibit shows the basic layout of a typical wholesaler’s operation and a retailer’s operation. Although the layouts of operations vary for both retailers and wholesalers, this exhibit will help us visualize the process of moving inventory from manufacturers into the hands of the ultimate end-user.

**Wholesalers**

Let’s begin with wholesalers. Wholesalers generally work within a particular industry (e.g., vegetable produce, running shoes, or calculators) to secure distribution contracts with a few key manufacturers. They receive goods in huge bulk shipments that they then break down for smaller shipments to retailers. This is a lot of inventory to manage, and a lot of money is at risk. Obviously, wholesalers will not make a profit unless there is a difference between the price at which they buy goods from manufacturers and the price at which they sell goods to retailers. However, the wholesaling process is much more involved than simply managing the cost of buying and selling goods. Quality and timeliness are also important performance measures that are critical to successful wholesale management. Not only must wholesalers negotiate profitable contracts with manufacturers, but they must then handle the logistics of transporting those goods long distances to multiple retail locations. This requires wholesalers to work closely with large transportation companies to both receive and ship out goods as quickly and inexpensively as possible. To help control transportation costs and make the process as timely as possible, wholesalers often locate their distribution centers near large transit hubs such as train yards, shipping docks, airports, and major freeways. Usually, these distribution centers are very large buildings with little advertisement of their business to passersby. If you happen to live or travel near a large transit hub, see if you can spot these giant distribution warehouses, typically surrounded by lots of trucks, trains, or ships.

**Retailers**

The business process for retailers is probably quite familiar to you. Most retailers place orders with and receive shipments from wholesalers. As shown in the floor plan in Exhibit 7, many retailers have a receiving dock and a breakdown area used to prepare goods for display on their sales floor. Some retailers also keep a stock room for holding excess inventory. However, the cost of holding inventory in today’s competitive environment is causing retailers to demand that wholesalers provide smaller and more frequent shipments. As a result, many retailers are able to avoid having a stock room. Inventory in these companies can then be moved directly from the breakdown area onto the sales floor.

Like wholesalers, retailers invest a lot of money in their inventory. Also similar to wholesalers, the big risk in the retailing business is having money tied up in inventory that is not selling. Obviously, having inventory is important to a retailer’s business, but holding on to inventory for too long usually results in a significant opportunity cost. For example, as long as a shoe retailer has its money currently invested in a large inventory of running shoes, it is unable to use that money to purchase basketball shoes. These opportunity costs become particularly painful when the retailer is unable to sell its inventory of running shoes during the running season and, as a result, lacks the money to purchase basketball shoe inventory in time for the basketball season. This is why management accountants in the merchandising business are so focused on measuring stockturns. The faster you can turn your stock (i.e., sell your inventory), the sooner you have the money available to purchase more inventory to sell. Obviously, retailers are just as concerned as wholesalers with the cost and timeliness involved in managing inventory. Further, given the demanding nature of today’s informed consumer, management accountants must
**Exhibit 7:** A Comparison of the Floor Plans for a Wholesaler and a Retailer

<table>
<thead>
<tr>
<th>Wholesaler’s Floor Plan</th>
<th>Retailer’s Floor Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory is delivered</td>
<td>Store Entrance</td>
</tr>
<tr>
<td>Receiving Dock</td>
<td>Stock Room</td>
</tr>
<tr>
<td>Breakdown Area</td>
<td>Stock Room</td>
</tr>
<tr>
<td>Pick and Package Area</td>
<td>Stock Room</td>
</tr>
<tr>
<td>Shipping Dock</td>
<td>Stock Room</td>
</tr>
<tr>
<td>Inventory is shipped</td>
<td>Stock Room</td>
</tr>
</tbody>
</table>
also provide retail managers with information on inventory quality. We'll talk more about the opportunity costs of holding inventory too long in a later chapter on monitoring performance.

**Product Cost Accumulation in Merchandising Organizations**

The bulk of this chapter so far has focused on manufacturing companies and how management accountants accumulate costs for these organizations. Although both merchandising and service organizations borrow much of their management accounting from the manufacturing industry, there are some important differences, as outlined below.

**Inventory Flow and the Income Statement**

In contrast to accounting for manufacturing businesses, the flow of costs through the merchandising accounting system is relatively simple. Examine Exhibit 8 and compare it to Exhibit 3 on page 125. Notice how simple the flow of inventory costs is in Exhibit 8. Essentially, accounting for inventory in merchandising organizations is a fairly straightforward process. There are no raw materials inventory, manufacturing overhead, or work-in-process inventory accounts. Merchandise inventory, by definition, is essentially complete and ready for sale when purchased. Hence, the cost of pur-

### Amazon Books

Some retailers do not have a physical store location where customers come to shop. Instead, they have created a virtual store on the Internet. One of the most successful examples of a retailer that exists solely in the virtual economy is AMAZON BOOKS. A brief tour of its virtual bookstore is quite impressive. Access the Web site for Amazon Books at [http://www.amazon.com](http://www.amazon.com) and click on the BOOKS tab at the top of the page. Explore this page and identify the “Amazon.com 100.”

**Net Work:**

1. What is it?
2. What book currently sits atop this list?

---

### Exhibit 8: Flow of Product Costs in a Merchant’s Cost Accounting System

**Accounts Payable**

Inventory is purchased

<table>
<thead>
<tr>
<th>Merchandise Inventory</th>
<th>Accounts Payable</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxxxx</td>
<td>xxxxx</td>
</tr>
<tr>
<td>xx</td>
<td>xx</td>
</tr>
</tbody>
</table>

Costs incurred to ship in inventory

<table>
<thead>
<tr>
<th>Merchandise Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxxxx</td>
</tr>
<tr>
<td>xx</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost of Goods Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxxxx</td>
</tr>
</tbody>
</table>

Inventory is sold

<table>
<thead>
<tr>
<th>Merchandise Inventory</th>
<th>Cost of Goods Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxxxx</td>
<td>xxxxx</td>
</tr>
</tbody>
</table>

Inventory is returned

<table>
<thead>
<tr>
<th>Merchandise Inventory</th>
<th>Cost of Goods Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxxxx</td>
<td>xx</td>
</tr>
</tbody>
</table>

**Journal entries:**

1. Merchandise Inventory ................. xxxxx
   Accounts Payable .................... xxxxx
   *Purchased inventory for sale.*
2. Merchandise Inventory ................. xx
   Accounts Payable .................... xx
   *Incurred freight in costs on purchased inventory.*
3. Cost of Goods Sold ................. xxxxx
   Merchandise Inventory ............. xxxxx
   *Sold inventory to customers.*
4. Merchandise Inventory ............. xx
   Cost of Goods Sold .............. xx
   Inventory is returned by customers.

*Note: Freight in is considered part of the purchase cost and should be added to inventory, eventually to be split between Cost of Goods Sold and the ending balance in Merchandise Inventory as goods are sold. In practice, the entire cost of freight in for a period is often simply debited directly to Cost of Goods Sold.*
chased inventory is debited to Merchandise Inventory throughout the year as it is acquired. Conceptually, the inventory costs for a merchant should also include all costs required to purchase the inventory, transport it to the merchant’s place of business, and prepare it for sale (unpacking, displaying, etc.). Hence, the inventory cost should include the purchase price, shipping costs (freight in), insurance while in transit, administrative costs incurred by the merchant related to purchasing and handling activities, and storage costs prior to sale. In practice, though, most of these overhead-related costs, other than freight in costs, are difficult to allocate to specific inventory items. As a result, overhead costs related to merchandise inventory are often expensed as a period cost and included in Selling and General Administrative Expenses.

As inventory is sold, the cost of inventory is credited from Merchandise Inventory and debited to Cost of Goods Sold. When customers return merchandise that can be resold, Cost of Goods Sold is credited and the inventory account is debited (if the returned merchandise cannot be resold, then nothing happens in either of these particular accounts).

Tracking inventory costs in a merchant’s accounting system may appear to be a fairly easy conceptual process. However, developing useful information on merchandise inventory for managers who need to plan, control, and evaluate inventory and inventory costs is a bit more involved. Managing merchandise inventory is a significant topic we’ll reserve for a later chapter.

TO SUMMARIZE: Merchants are interconnected with manufacturers in a distribution channel that basically involves manufacturers selling to large-scale wholesalers, who then sell to retailers, who then sell to the end-user customer. Managing the movement (i.e., logistics) of inventory across the distribution channel is a critical business activity. Because wholesalers and retailers generally do not have to deal with raw materials or work in process, the process of accounting for inventory in a merchandising business is not nearly as complicated as it is in a manufacturing business. However, managing inventory costs (discussed in a later chapter on managing inventory) is both complicated and critical for a merchant.

The Flow of Services and Costs in Service Companies

Explain the flow of goods and services in a service organization and follow the corresponding accumulation of product costs in the accounting system.

So far in this chapter we have defined and discussed the nature of manufacturing and merchandising businesses and identified examples of companies in each type of business. The third type of business is service. What is a service business? Frankly, this is a rather difficult question. Simply stated, the service industry in the United States generally comprises all businesses that cannot be classified as merchandising or manufacturing (this assumes that we classify organizations that convert natural resources into useful products, such as farming or mining, as manufacturers). This is obviously a simple definition, but it is not very useful for us. It is important to more precisely define the service industry because nonmerchandising/nonmanufacturing businesses are the largest and fastest-growing sector in our economy. Hence, it is more likely that your career will involve working with service businesses than any other business type. For our purposes, we’ll define a service business as follows:

A service business is any organization whose main economic activity involves producing a nonphysical product that provides value to a customer.

6 Recall that this method of continuously debiting and crediting Merchandise Inventory as inventory is purchased and sold (and debiting Cost of Goods Sold as inventory is sold) is called the perpetual inventory method of accounting. The alternative to the perpetual method is the periodic inventory method. There are several more accounts involved with the periodic inventory method, including Purchases, Purchase Discounts, and Purchase Returns. A significant difference between the perpetual and periodic inventory methods is that the periodic inventory method adjusts Merchandise Inventory only at the end of each period when cost of goods sold is calculated for the income statement.
The definition sounds pretty academic, but it needs to cover a lot of conceptual ground. As you’ll see in the list in Exhibit 9, there is a lot of variety in the specific types of organizations that are neither merchandising nor manufacturing. As you study Exhibit 9, try to apply our definition of a service business to each of these categories and see if the definition fits.

### Comparing Service and Manufacturing Business Activities

Service companies actually share more similarities with manufacturing companies than with merchandising companies. In this section, we will discuss the similarities of and the differences between service and manufacturing firms.

#### Similarities between Service and Manufacturing Firms

As you now understand, merchants purchase goods from manufacturers in finished condition. As a result, inventory in merchandising companies requires little, if any, conversion cost before being sold to customers. Inventory costs used to determine cost of goods sold on the merchant’s income statement are relatively easy to determine. On the other hand, like manufacturers, most service companies perform a significant number of activities to prepare their service products for sale and delivery to their customers. Typically, a lot of direct labor and overhead is involved in a service business. Hence, the management process in service organizations shares a number of similarities with the process of managing a manufacturing business.

Most service companies engage in a very real production activity. However, what they provide is not nearly as tangible as the product provided by manufacturers. Yes, an architect or engineer does provide a tangible set of drawings or blueprints. But what is really being sold is the knowledge and customized advice that is represented by the drawings.

Service companies essentially build a product (the service) and deliver it to the customer (versus a merchant that resells a product built by another company). Consider the organizational effort required for a CPA firm to provide an audit service to a client. This organization is depicted in Exhibit 10. As you can see, there is direct labor (the auditing staff) involved in this audit that is supported by a complex system of supervisors, supplies, equipment, capital as-

### Exhibit 9: Categories of Service Businesses

- Accounting/legal
- Architectural/engineering
- Communications (e.g., television, radio, etc.)
- Banking/financial (including insurance, investment brokers, consulting, etc.)
- Health care
- Software/systems integration (e.g., programming, installation, service, consulting, etc.)
- Marketing/advertising
- Public utilities
- Research and development
- Transportation
- Entertainment
- Education and training (not including state-owned schools and universities)

sets, computer network and databases, and so forth. This support system essentially forms the overhead costs of the audit product, and these overhead costs will need to be appropriately allocated as part of the product cost of the audit. You can see, then, that there are many similarities between the process of manufacturing and service companies.

**Differences between Service and Manufacturing Firms**

Some service organizations do sound as though they are really in the manufacturing business. Notwithstanding, there are some important differences between most service and manufacturing businesses that affect the information provided by management accountants. Whereas manufacturers are dependent on merchants to distribute their products to the final customers, most service businesses deal directly with the end-user customer. Also, there is probably a lot more customization in the service process than in the manufacturing process. Hence, most service businesses use a job order approach rather than a process approach to cost accounting. Additionally, very little raw material is involved in the process of converting labor or capital equipment into a service product. Note, though, that items such as paper and syringes are sometimes included as part of the delivered service, but these items are not the main focus of what the customer is paying to receive. As a result, raw material inventories are typically insignificant or nonexistent in a service business. Similarly, it is often difficult to store a finished service in anticipation of a later sale to customers, making finished goods inventories insignificant or
nonexistent. At the close of a reporting period, however, most service companies will be in the process of completing a service for delivery to a customer. This indicates that work-in-process inventories exist and may be significant for many service organizations. (We will discuss work-in-process inventories further below.)

**Product Cost Accumulation in Service Organizations**

As you now understand, there are a number of accounting similarities between manufacturing and service organizations. One important similarity is that both manufacturing and service organizations use a significant amount of direct labor in producing their products. In addition, large amounts of overhead costs typically are allocated to individual products. Similar to many manufacturers, service businesses often allocate overhead on the basis of direct labor hours. One important difference is that manufacturers must also manage large amounts of raw materials costs, while the materials included in the services sold by service companies are typically limited to insignificant amounts of supplies used in the service process.

**"Inventory" Flow and the Income Statement in Service Companies**

Exhibit 11 summarizes the flow of costs for a service company. Comparing Exhibit 11 to Exhibits 3 and 8 illustrates that accounting for service cost flows can be more complicated than accounting for merchandise inventory cost flows, but is quite similar to accounting for manufacturing cost flows. Materials (e.g., supplies), labor, and overhead costs are all involved in, and should be assigned to, the process of creating and delivering a service product to the customer.

The overhead for service firms can involve nearly any kind of management costs—service firms generally do not distinguish between manufacturing and administrative overhead costs. Allocating overhead to service activities generally involves factoring an overhead rate into the billing rate used to charge customers. Think about all the services you buy and use. Often, some type of a billing rate per hour or per event is used to determine the price you pay for the service. For example, accountants, lawyers, consultants, computer programmers, and automotive repair shops often charge by the hour. When you get the bill, you understand that the huge rate per hour does not represent solely the wage or salary of the professional who provided the service to you. This rate has been enhanced (sometimes significantly!) in order to cover all the overhead and supplies costs necessary to support the work done by the service professional. Similarly, doctors, trainers, entertainers, and transportation companies usually charge by event. You understand that the doctor isn’t paid the full $175 charge when he or she gives you a physical exam. Much of that amount goes to pay for the costs of staff, equipment, and building occupancy necessary to support the actual service provided by your doctor.

Assigning overhead costs to a service event follows a pattern very similar to that for manufacturing firms. Total overhead for the service organization is estimated for a period of time, generally a year. This estimated overhead is then divided by an appropriate activity measure. For an accountant, this activity measure may be billable hours. The measure for a bank could be the number of teller transactions or number of accounts. For a cable TV company, it could be the average number of accounts expected for the year or the total billable months of service. The activity measure for an electric company might be the expected number of kilowatts produced during the next year. Other examples of possible overhead rate calculations for several types of service companies are shown below.
With a predetermined overhead rate, service companies are able to allocate overhead costs to service events as they occur. This method of allocating overhead helps managers control overhead costs, establish prices for services provided, and measure profit on each service event or contract. The overhead account for a service company is used in much the same manner as in a manufacturing firm. As actual overhead costs are incurred, they are debited to the overhead account rather than being debited to an expense account. Then, as the appropriate overhead activities actually take place (e.g., consulting hours, teller transactions, and kilowatts), overhead costs are allocated to Work-in-Process Services (more about this account in the next section). As services are actually billed, these overhead costs are combined with the direct labor costs of the service professionals (if any) and any incidental costs of supplies are debited to Cost of Services (an account very similar to the cost of goods sold account used by manufacturers and merchants). At the

STOP & THINK

The selection of the activity base that is used to allocate overhead is a very important management decision because any particular activity base could have a significant impact on how much cost is assigned to one product versus another. For example, suppose that the academic advisement center at your college is trying to determine what it costs to provide advisement services to a specific student each semester. What are some possible activity bases this department might use to allocate the costs of the office equipment, supervisor salary, and other overhead items? Would your choice of a base have an effect on which students are then identified as “high-cost-to-serve” students?
end of the year (or any other time period relevant to the company), the total actual overhead costs are compared to the total allocated overhead costs to determine an over- or underapplied overhead amount. If overhead is overapplied, there will be a credit balance in the service company’s overhead account. This balance means that too much overhead cost was allocated to the cost of service activities. The overapplied costs are removed (and the overhead account is closed) with the following entry:

\[
\text{Overhead} \quad \text{xxx} \\
\text{Cost of Services} \quad \text{xxx}
\]

If overhead is underapplied, then there will be a debit balance in the overhead account, and Cost of Services is adjusted (increased) by closing the overhead account with the following entry:

\[
\text{Cost of Services} \quad \text{xxx} \\
\text{Overhead} \quad \text{xxx}
\]

Similar to manufacturing firms, the service company may choose to apportion the over- or underapplied overhead amount between Cost of Services and Work-in-Process Services. The question you might be asking at this point is, “Why would a service organization have a work-in-process inventory account?” Good question! We’ll talk about this account next.

**Who Has Work-in-Process Inventory?**

In manufacturing companies, accounting for work-in-process inventory is a significant part of the product cost accounting effort. Costs of resources used in the process of creating a product are attached to that product. Typically, at the end of an income period (e.g., a month, a quarter, or a year), a number of products are still in process. A significant amount of costs can be tied up in these in-process products. GAAP requires that these costs be capitalized (identified as assets) and assigned to the balance sheet until the products are actually sold. Only at the time that goods are sold and revenue is recognized are the related costs charged to the income statement. The basic underlying accounting concept behind this approach is the all-important matching principle.

The logic for identifying work-in-process inventory as a balance sheet asset applies to both manufacturing and service businesses. Service companies typically earn revenue as the service is provided to the customer. At the end of an accounting period, however, significant effort and resources may have been invested in a service product that is not yet completed for the customer. As a result, revenue is not yet earned, and the costs invested at this point should not be recognized as expenses. In other words, until they actually complete the project and bill it to the client, service companies have work in process.

The following are some examples of work in process that are likely to exist at the end of an accounting period for various types of service companies:

- Accounting/legal—An audit that will take three months to complete is in its initial stage.
- Architectural/engineering—The blueprints for a large construction project are only partially completed.
- Banking/financial—The fieldwork has been completed and the lending documents are being finalized for a large loan that will be closed next month.

---

• Marketing/advertising—Three weeks of effort have been expended on the development of a new advertising campaign that will not be ready for presentation to the client for another three weeks.

• Transportation—A large shipment of coal is being held in a midwestern freight yard en route to its shipping point on the East Coast.

In each of these examples, resources have been invested in creating a service that the customer has not yet received. As a result, work in process exists and should be recognized on the balance sheet. As you can see in Exhibit 11, as supplies and labor costs are directly invested in the process of creating a service for customers, these amounts are debited to Work-in-Process Services. As overhead costs such as utilities, rent, taxes, and support staff salaries are incurred, these costs are debited to the overhead account and are subsequently allocated to Work-in-Process Services using an overhead rate. When the service is completed and delivered to the customer, then the revenue earning process is complete and the service costs are transferred out of Work-in-Process Services and into Cost of Services.8

8 Some fairly large long-term service contracts are sometimes designed to allow the provider to bill and receive partial payments as the contract is completed. In these cases, as the revenue process is partially completed, some service costs can be transferred out of Work-in-Process Services and into Cost of Services. Learning about this type of accounting, called percentage-of-completion accounting, is reserved for more advanced accounting courses.


TO SUMMARIZE: Essentially, a service business is any organization whose main economic activity involves producing a nonphysical product that provides value to a customer. Because service companies generally create the service they provide, they have some similarities with manufacturing companies in both the management and the accounting processes, including the need to manage and account for work in process. A major difference between service and manufacturing operations is that raw materials typically are not a significant component of a service company’s product. Costs flow through a service firm in a manner very similar to a manufacturing firm. Costs of supplies (usually insignificant in size) and direct labor (usually significant in size) accumulate in an account called Work-in-Process Services. This account performs much the same function as a work-in-process inventory account in a manufacturing firm. In addition, overhead must often be applied to Work-in-Process Services as service activities take place. The process of applying overhead is typically done using a predetermined overhead application rate.

The Effect of E-Business

7 Understand the impact of e-business on product costing.

Before we conclude the main part of this chapter, we should say a little about the impact of e-business on business organizations and the product costing process.9 First of all, it is important to understand that e-business is not a separate new industry like manufacturing, merchandising, or service. Rather, e-business provides new platforms for conducting business within the current industries in the economy.

You have probably had some experience in shopping on the Internet. Most organizations today have an Internet site. Often all you have to do is open your Internet browser and add a “.com” to the end of the name of your favorite company, and you can be doing business with that company in no time. Obviously, a lot of business is being transacted on the Internet. However, the lion’s share of Internet business is not taking place with individual consumers like most of us. To help you understand this point, we need to distinguish between two kinds of e-business. One kind is conducted between companies and consumers (or end-users). This sort of business is often referred to as business-to-consumer (or “B2C”). When you shop at WALMART.COM or NORDSTROMS.COM, you’re engaged in B2C e-business. B2C e-business in the United
### The Birth of an e-Business

Jeffrey P. Bezos quit his lucrative job with a New York investment firm and moved his family to Seattle, Washington, to start a new company in a new industry. A short time later, on July 16, 1995, **AMAZON.COM**, the largest e-tailer in the world in 2001, opened its Web doors. After having 300 of his friends and family members test the site, Jeff asked them to tell everyone they knew about Amazon.com. Within 30 days, with no press or traditional advertising, Amazon.com had sold books in all 50 states and 45 countries—an instant Web success! How did this all begin?

Amazon.com began as a bookseller over the Internet that offered competitive prices, accessibility, and extreme convenience. It was readily apparent to Bezos, as his book-selling Web site grew exceptionally fast, that Amazon.com could become the “Earth’s Biggest Store.” In 1998, Amazon.com offered its first product other than books—music CDs. From there, Amazon.com has expanded into videos, DVD movies, toys, hardware, greeting cards, electronics, software, home improvement products, auctions, and more. How does Amazon.com manage this huge distribution channel?

With more than 2 million unique visitors a month currently, Amazon.com has established a highly automated system that prides itself on discovering and satisfying customer needs. In addition, the Amazon system must maintain a critical relationship with manufacturers and suppliers. One glitch in the system could spell disaster for the company and its end-users (us!). The life of an order begins well before a customer hits the “Buy it” button on the site. Management must forecast consumer needs, arrange to be able to ship merchandise from suppliers on demand, maintain a precise calculation of inventory available from its suppliers, and meet customer demands quickly and effectively. One of the original strengths of Amazon’s business model was that it rarely held inventory (recently, Amazon expanded its business operations significantly by building some large distribution warehouses that do hold inventory). Instead, in many cases Amazon has direct connections to its suppliers that allow customer orders to be shipped directly from supplier to customer. Computers track most of this complicated distribution channel, but it is the knowledge of management that ultimately provides the success that Amazon.com enjoys.

**Source:** J. C. Ramo, “1999 Person of the Year,” *Time*, December 27, 1999.

### FYI:

Many people originally predicted that the Internet would significantly change how goods and services are sold. The reality is that, in the first quarter of 2003, only 1.5% of consumer retail sales takes place on the Internet. In other words, the Internet is not creating a lot of new sales. Nevertheless, 1.5% of retail sales in the first quarter of 2003 represents nearly $14 billion! More importantly, the percentage of Internet retail sales has doubled since the first quarter of 2001.


States amounted to 71 billion in 2001 and is expected to continue growing at a significant rate in the future. In addition, business also takes place between businesses, such as the purchase of raw materials, consulting, outsourcing of services, and important partnerships or joint ventures where companies work together to provide goods and services to the public. When this work is managed with Internet-type technology, it is referred to as a business-to-business process (or “B2B”). This aspect of e-business is, frankly, huge. B2B e-business amounted to $995 billion in 2001 and is growing very fast!10

As manufacturers, merchants, and service providers move more and more of their business onto the Internet, they expect to enjoy a number of significant benefits, including expanded sales opportunities; improved communications, customer service, and loyalty; and better management of human resources and supply channels. Perhaps most relevant to this chapter is the fact that companies expect to lower their costs of business using Internet technology. For example, bank transactions involving a teller cost an average of $1.07 per transaction. On the other hand, ATM transactions cost just $0.39. However, when you log on to your bank at its "com" Internet site, an online banking transaction costs only $0.01! As another example, IBM bought $13 billion worth of goods and services
over the Internet in 1999, saving more than $270 million in procurement costs. Further, SOUTHWEST AIRLINES saved $80 million in 2000 in commissions and reservation-system fees by Web-enabling its reservation and ticketing processes. E-billing, the delivery of routine bills online, can save as much as 60% per bill in handling costs. Hence, cost savings in running a billing process at a large utility could be as much as $50 million per year when an e-billing process is implemented. WAL-MART has achieved tremendous improvements in the costs, quality, and timing of goods purchased from wholesalers through the use of inventory management systems that have direct Internet-based connections to its suppliers. Even hiring costs can be reduced, as evidenced by the fact that IBM has installed Internet software that has cut the cost of hiring temporary workers by $3 million annually.

E-business can have tremendous impacts on product costs. Specifically, costs of raw materials are reduced as organizations use the Internet to find and demand better pricing and save significant costs in the process of ordering and managing raw material inventories. Costs of direct labor can also be better managed by using the Internet to identify, hire, and train the organization’s workforce. In some cases, direct service labor, such as bank tellers, are redeployed to new assignments in the organization as Internet technology becomes the means of interacting with clients and customers. Perhaps most significantly, companies are making significant changes in the structure of their organizations, which can greatly affect the costs of overhead. At many companies, overhead costs are much higher than the costs of raw materials/supplies and direct labor combined, so finding new ways to handle the management and logistics of a company can have immediate and important impacts on costs. The example of IBM using the Internet to change the way it obtains goods and services (and temporary employees) demonstrates the savings that can result.

FYI:
Car manufacturers are rushing to become “the Dell of automobile manufacturing.” DELL COMPUTERS has made an important name for itself by its ability to use the Internet to deliver custom-built computers to individual customers in a matter of days. Harold Kutner, a GM executive, is one example of a business professional who is focused on using the Internet (as well as a complete redesign of the GM design and production process) to deliver custom-built cars in 4 to 11 days (down from the normal 3 to 8 weeks).


TO SUMMARIZE: E-business and Internet technology are dramatically changing all types of business organizations, including manufacturing, merchandising, and service organizations. As these companies make adjustments in both their organizational structure and in the way they connect to and do business with suppliers and customers within their distribution channel, there have been (and will continue to be) significant changes and improvements in the costs, quality, and timeliness of goods and services. These changes are affecting the process of both business-to-consumer (B2C) and business-to-business (B2B) operations.

In the first part of the chapter we illustrated product costing using the job order costing method. This method is commonly used in both manufacturing and service organizations. In this expanded material section, we discuss how companies, predominantly manufacturers, use process costing when it is difficult to specifically identify unique products or jobs during the manufacturing process.

The Process Costing System

8 Use the FIFO method to do process costing.

All the product costing methods described so far in this chapter assume that the accountant is able to specifically identify the job (i.e., the product or service) being produced for customers.
process costing  A method of product costing whereby costs are accumulated by process or work centers and averaged over all products manufactured in a center or department during a particular production period. There are two methods of process costing: The FIFO method separately tracks the costs of beginning work-in-process units and the costs of units started in the current production period. The weighted-average method (not discussed in this text) averages together the costs of beginning work-in-process units and the costs of units started in the current production period.

equivalent units of production  A method used in a process costing system to measure the production output during a period. Equivalent units of production essentially measures the “work done” by the center or department in terms of units of output.

By identifying each specific job, the accountant is then able to specifically track a job as it moves through the work-in-process inventory and into the finished goods inventory. While it is in the production process, the accountant assigns the actual direct materials and direct labor costs, as well as allocates a specific amount of overhead costs, that are required to produce a particular job. This cost accounting method is often referred to as job order costing. Some manufacturing companies cannot use job order costing because they cannot specifically identify each job (product) being produced. Examples of such companies include manufacturers of bricks, lumber, paint, soft drinks, and newspapers and most food processing plants. These companies manufacture large volumes of product using a series of uniform processes. For these companies, process costing is the appropriate product cost accounting method. Because these companies can’t focus on costing a particular job, they focus on costing the amount of work done for a particular period of time. We’ll talk more about this concept of work done in a particular time period below. For now, remember that for process costing to be appropriate, two general conditions typically exist:

1. The activities performed in each process center are identical for all units.
2. The units produced as a result of passing through the process centers are basically the same.

Steps in Process Costing

A firm whose products and processes meet the preceding conditions would employ process costing using five steps:

1. Identify units that went into the process and identify where those units are at the end of the processing time. Determine the amount of “work done” (equivalent units of production) during the processing time period.
2. Determine the amount of production costs that went into the process and compute the product costs per unit for the processing time period.
3. Compute the total cost of units completed and transferred out (cost of goods manufactured) during the processing time period.
4. Compute the total cost of units remaining in process (ending work-in-process inventory) at the end of the processing time period.
5. Prepare the production cost report.

Step 1. Compute Equivalent Units of Production

The first step in process costing is to track the flow of units and compute the equivalent units of production. The concept of equivalent units of production essentially means to calculate the amount of work actually done during any particular period of time in terms of units of output. It’s really a very simple concept. For example, let’s assume that you are being paid by the hour to hand paint porcelain figurines for a small local art shop. It’s an arduous process, taking several hours to paint a single figurine. On average, you can do only three or four figurines per day. At the end of your first day on the job, you have painted three figurines and have another one nearly complete. If your boss were to ask you how much work you did for the day, are you going to reply that you painted only three figurines? Of course not! Instead, you’ll likely tell her that you completely painted three figurines and that you have another one nearly done (let’s say it is 90% done). So, did you paint four figurines? Not really. The amount of work done on your first day is 3.9 figurines (three whole units plus 90% of a fourth unit), right? In other words, you did 3.9 equivalent units of production. The work that you have done includes one unit in ending work-in-process inventory (the figurine that is 90% done).

The more interesting measure of equivalent units of production is what happens on your second day on the job. When you come back to the shop the next day, the first thing you will do is work on that day’s beginning work-in-process inventory, which is the figurine that is 90% done from the day before. Let’s assume that you then start and complete three more figurines.

11 This is the reason we call this particular method of process costing the FIFO (first in, first out) method. It is based on the assumption that all beginning work-in-process inventory is completed before any new units are started.
Before it’s time to go home, you are able to start one more figurine and get it about 30% done. Now how do you answer the boss’s question about how much work was done on your second day? You completed a total of four figurines (the figurine that was work-in-process when you came to work plus three more that were both started and completed this same day), but to say that you did the work of four figurines isn’t quite accurate, is it? To be accurate, you completed 10% of one figurine, 100% of three figurines, and 30% of a final figurine that is still work-in-process. In other words, the work done for the day was 3.4 figurines, computed as follows:

<table>
<thead>
<tr>
<th>Physical Units</th>
<th>Percent Completed (i.e., “work done”)</th>
<th>Equivalent Units of Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning work-in-process</td>
<td>1 × 10%</td>
<td>= 0.1</td>
</tr>
<tr>
<td>Started and completed</td>
<td>3 × 100%</td>
<td>= 3.0</td>
</tr>
<tr>
<td>Ending work-in-process</td>
<td>1 × 30%</td>
<td>= 0.3</td>
</tr>
<tr>
<td>Total equivalent units of production</td>
<td></td>
<td>= 3.4</td>
</tr>
</tbody>
</table>

With this example of equivalent units of production in mind, let’s now use an example that’s more representative of manufacturers that follow the process costing approach to accounting for product costs. Exhibit 12 shows how products and costs move through the two process centers (mixing and bagging) of the Allied Cement Company. For now, we will focus on the process costing for the mixing center at Allied Cement. Production units at Allied are measured in pounds of finished cement. When the mixing machines are shut down at the end of a production period (let’s assume a production period at Allied is one month), not all pounds of cement started the last day of the month in the mixing center will have been completed. In fact, as at most manufacturers, units are usually in process at both the beginning and the end of a period. Were it not for these beginning and ending work-in-process inventories, the number of units actually produced in the mixing center for the period could be determined merely by counting all pounds of cement that were transferred out of the mixing center and into the bagging center. However, as you saw in our earlier example of hand painting figurines, the amount of work actually done in the mixing center for the period also includes how much work was done in the beginning and ending work-in-process inventories.

With this in mind, look at the report below on equivalent units of production for the mixing center.

**Step 1: Compute equivalent units of production.**

<table>
<thead>
<tr>
<th>Physical Units (pounds)</th>
<th>Direct Materials Costs</th>
<th>Conversion Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent Done</td>
<td>Equivalent Units</td>
</tr>
<tr>
<td>Beginning work-in-process</td>
<td>4,000    × 0%</td>
<td>= 0   × 80%</td>
</tr>
<tr>
<td>Started and completed</td>
<td>44,000   × 100%</td>
<td>= 44,000</td>
</tr>
<tr>
<td>Ending work-in-process</td>
<td>2,000    × 100%</td>
<td>= 2,000</td>
</tr>
<tr>
<td>Equivalent units of production</td>
<td>46,000</td>
<td>48,400</td>
</tr>
<tr>
<td>Transferred out (to Bagging)</td>
<td>48,000</td>
<td></td>
</tr>
</tbody>
</table>

The “Physical Units” column reports that the mixing center had 4,000 pounds of cement in beginning work-in-process when the month started. The department finished mixing these 4,000 pounds and mixed an additional 44,000 pounds before the end of the month, allowing the mixing center to transfer a total of 48,000 pounds to the bagging center. At the end of the month, 2,000 pounds of cement remained in ending work-in-process.
Now look at the “Equivalent Units” column for the Direct Materials Costs. In this case, all of the materials necessary to mix a pound of cement are put in place at the beginning of the mixing process. In other words, when the month began, the 4,000 pounds of cement in beginning work-in-process were already 100% complete in terms of materials. Similarly, at the end of the month, the 2,000 pounds of cement in ending work-in-process were 100% complete in terms of materials. As a result, the equivalent units of production (i.e., “work done”) to be used when accounting for costs of direct materials for Allied is simply the number of pounds of cement started into production during the production period, or 100% of units started and completed plus 100% of units in ending work-in-process (and 0% of units in beginning work-in-process).

Finally, look at the “Equivalent Units” column under “Conversion Costs.” Conversion costs is the term we use to describe all product costs necessary to “convert” raw materials into finished goods. Hence, conversion costs include all costs of direct labor and manufacturing overhead. In this example, at the beginning of the month, the beginning work-in-process inventory was 20% complete in terms of costs of direct labor and manufacturing overhead. As a result, the first work done in the mixing center for the current production period was to finish the remaining 80% of the effort required to complete these 4,000 pounds of cement. In other words, the mixing center did 3,200 equivalent units of production (4,000 × 80%) on beginning work-in-process. At the end of the month, there were 2,000 pounds in ending work-in-process that were 60% complete in terms of direct labor and manufacturing overhead costs, which means that the mixing center did 1,200 equivalent units of production (2,000 × 60%) on ending work-in-process. When combined with the work done on units started and completed, the mixing center’s “work done” in terms of direct labor and manufacturing overhead was 48,400 equivalent units (3,200 + 44,000 + 1,200).

Step 2. Compute the Product Costs per Unit

With Step 1 completed, we know how much work was done in terms of production output for the mixing center. Now, to compute the product cost per unit, we need to determine how...
much was spent on production. For the mixing center, we will assume that the beginning work-in-process of 4,000 pounds includes $800 in direct materials and $1,200 in direct labor and manufacturing overhead (i.e., conversion costs). Further, Allied spent $9,660 for direct materials and $70,180 for conversion costs in the current production period. Computing the product costs per unit (pound) for the mixing department is then a simple matter of dividing the product costs by the appropriate equivalent units of production, reported as follows:

<table>
<thead>
<tr>
<th>Step 2: Compute the product costs per unit.</th>
<th>Total Costs</th>
<th>Equivalent Units</th>
<th>Cost per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beginning work-in-process</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct materials costs</td>
<td>$ 800</td>
<td>× 4,000</td>
<td>$0.20</td>
</tr>
<tr>
<td>Conversion costs</td>
<td>1,200</td>
<td>× 800</td>
<td>1.50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$ 2,000</td>
<td></td>
<td><strong>$1.70</strong></td>
</tr>
<tr>
<td><strong>Current period</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct materials costs</td>
<td>$ 9,660</td>
<td>× 46,000</td>
<td>$0.21</td>
</tr>
<tr>
<td>Conversion costs</td>
<td>70,180</td>
<td>× 48,400</td>
<td>1.45</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$79,840</td>
<td></td>
<td><strong>$1.66</strong></td>
</tr>
</tbody>
</table>

As you can see in the report above on product costs per unit, Allied spent $0.21 per pound for direct materials in the mixing center in the current production period. This cost is based on dividing the total equivalent units of 46,000 for work done on direct materials into the total direct materials costs of $9,660. Bearing in mind that beginning work-in-process came from the previous production period, Allied can compare the current direct materials cost to the direct materials cost in the previous production period, which was $0.20 per pound. This cost is obtained by dividing the costs of direct materials in beginning work-in-process by the equivalent units in beginning work-in-process (remember that when the day begins, all 4,000 pounds in inventory are 100% done with respect to direct materials). The current-period conversion cost per unit is $1.45, based on dividing the total equivalent units of 48,400 for work done in terms of direct labor and manufacturing overhead into the total conversion costs of $70,180. Again, Allied’s management can check their efforts to control conversion costs by comparing the current-period costs with the previous period’s cost of $1.50 per pound, which is calculated by dividing conversion costs in beginning work-in-process by the work already done in beginning work-in-process when the month begins (800 equivalent pounds = 4,000 physical pounds × 20% “work done”).

**Step 3. Compute the Costs Transferred Out**
Allied has spent a total of $79,840 in the current production period in the mixing center. In addition, when the production period began, there was work-in-process inventory in the mixing center that had a total value of $2,000. Hence, as you can see in the report above on product costs per unit, the mixing center needs to account for $81,840. Assuming that there has been no waste or pilferage in the mixing process, at the end of the production period all costs have either been transferred out to the bagging center or remain in ending work-in-process. To compute the costs transferred out to the bagging center, the mixing center needs to account for the costs of completing the cement in beginning work-in-process, as well as the cement that was started and completed in the current period. The following report shows the costs transferred out:
Step 3: Compute the costs transferred out.

<table>
<thead>
<tr>
<th>Cost per Unit</th>
<th>Equivalent Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beginning work-in-process</strong></td>
<td></td>
</tr>
<tr>
<td>Initial direct materials costs</td>
<td>$800</td>
</tr>
<tr>
<td>Initial conversion costs</td>
<td>1,200</td>
</tr>
<tr>
<td>Costs to complete materials</td>
<td>$0.21 $x 0 = 0</td>
</tr>
<tr>
<td>Costs to complete conversion</td>
<td>$1.45 $x 3,200 = 4,640</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$6,640</td>
</tr>
<tr>
<td><strong>Started and completed</strong></td>
<td>$1.66 $x 44,000 = 73,040</td>
</tr>
<tr>
<td><strong>Total costs transferred out</strong></td>
<td>$79,680</td>
</tr>
</tbody>
</table>

As you can see in the above report, the mixing center did not need to add any more direct materials costs to complete the beginning work-in-process. However, there were 3,200 equivalent units of work in terms of direct labor and manufacturing overhead that needed to be completed in the current period before the 4,000 pounds of cement in beginning work-in-process could be transferred out to the bagging center. Hence, the mixing department spent $4,640 in conversion costs ($1.45 per unit $x$ 3,200 equivalent units) to complete the mixing on beginning work-in-process. When added to the initial beginning work-in-process costs of $2,000 ($800 + $1,200), the first 4,000 pounds of cement transferred to the bagging center carried total production costs of $6,640.

Of the total 48,000 pounds transferred to the bagging center, 44,000 pounds were started and completed in the current production period. At a total cost per unit of $1.66 ($0.21 per unit for direct materials + $1.45 per unit for direct labor and manufacturing overhead), the mixing department spent $73,040 to mix the remaining units transferred out of its operations in the current production period.

Step 4. Compute Costs of Ending Work-in-Process Inventory

The fourth step in the mixing center’s process costing effort is to determine the costs of the 2,000 pounds of cement remaining in work-in-process inventory at the end of the current production period. These calculations are reported below.

<table>
<thead>
<tr>
<th>Cost per Unit</th>
<th>Equivalent Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs for direct materials</td>
<td>$0.21 $x 2,000 = $420</td>
</tr>
<tr>
<td>Conversion costs</td>
<td>$1.45 $x 1,200 = 1,740</td>
</tr>
<tr>
<td><strong>Cost of ending work-in-process</strong></td>
<td>$2,160</td>
</tr>
</tbody>
</table>

Because all 2,000 pounds are 100% complete in terms of direct materials, this inventory represents $420 ($0.21 per unit $x$ 2,000 pounds $x$ 100%) in direct materials costs. On the other hand, because these 2,000 pounds are only 60% complete in terms of direct labor and manufacturing overhead, there are $1,740 ($1.45 per unit $x$ 2,000 pounds $x$ 60%) in conversion costs residing in ending work-in-process inventory. In total, ending work-in-process contains $2,160 ($420 + $1,740) in product costs.

Step 5. Prepare the Production Cost Report

All the data calculated so far are combined into the production cost report for the mixing center. This report is shown in Exhibit 13. As you can see, this report includes a large number of calculations. However, we’ve carefully worked through all the calculations in this report together, so you should feel fairly comfortable understanding how it all fits together. (You’ll feel
### Equivalent Units of Production

<table>
<thead>
<tr>
<th>Physical Units (pounds)</th>
<th>Direct Materials Costs</th>
<th>Conversion Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent Done</td>
<td>Equivalent Units</td>
</tr>
<tr>
<td>Beginning work-in-process</td>
<td>4,000 × 0% = 0</td>
<td></td>
</tr>
<tr>
<td>Started and completed</td>
<td>44,000 × 100% = 44,000</td>
<td></td>
</tr>
<tr>
<td>Ending work-in-process</td>
<td>2,000 × 100% = 2,000</td>
<td></td>
</tr>
<tr>
<td>Equivalent units of production</td>
<td>46,000</td>
<td></td>
</tr>
<tr>
<td>Transferred out</td>
<td>48,000</td>
<td></td>
</tr>
</tbody>
</table>

### Product Costs Per Unit

#### Total Costs

<table>
<thead>
<tr>
<th></th>
<th>Total Costs</th>
<th>Equivalent Units</th>
<th>Cost per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beginning work-in-process</strong></td>
<td>$800</td>
<td>4,000</td>
<td>$0.20</td>
</tr>
<tr>
<td><strong>Conversion costs</strong></td>
<td>$1,200</td>
<td>800</td>
<td>1.50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$2,000</td>
<td>800</td>
<td>1.70</td>
</tr>
<tr>
<td><strong>Current period</strong></td>
<td>$9,660</td>
<td>46,000</td>
<td>$0.21</td>
</tr>
<tr>
<td><strong>Conversion costs</strong></td>
<td>$70,180</td>
<td>48,400</td>
<td>1.45</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$79,840</td>
<td>48,400</td>
<td>1.66</td>
</tr>
</tbody>
</table>

**TOTAL DOLLARS IN** $81,840

#### Costs Transferred Out

<table>
<thead>
<tr>
<th></th>
<th>Cost per Unit</th>
<th>Equivalent Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beginning work-in-process</strong></td>
<td>$800</td>
<td>4,000</td>
</tr>
<tr>
<td><strong>Conversion costs</strong></td>
<td>$1,200</td>
<td>800</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$2,000</td>
<td>800</td>
</tr>
<tr>
<td><strong>Started and completed</strong></td>
<td>$1,660</td>
<td>44,000</td>
</tr>
<tr>
<td><strong>Total costs transferred out</strong></td>
<td>$79,680</td>
<td>73,040</td>
</tr>
</tbody>
</table>

#### Costs of Ending Work-in-Process

<table>
<thead>
<tr>
<th></th>
<th>Cost per Unit</th>
<th>Equivalent Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct materials</strong></td>
<td>$0.21</td>
<td>2,000</td>
</tr>
<tr>
<td><strong>Conversion costs</strong></td>
<td>$1.45</td>
<td>1,200</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$2,160</td>
<td></td>
</tr>
</tbody>
</table>
more comfortable once you’ve worked through the review problem at the end of this chapter and a few homework problems!) Remember that the report is composed of four overall steps, each of which should make sense to you.

When a lot of calculations are involved, as in the production cost report in Exhibit 13, a good check figure can be a wonderful tool! Notice in Exhibit 13 that the arrows point to a very good check figure—$81,840. This amount represents the total dollars that have gone into the mixing center in the current period ($2,000 in beginning work-in-process + $79,840 in current production costs), as well as the total dollars that have come out of the mixing process ($79,680 transferred out + $2,160 in ending work-in-process). If the production cost report can balance out to this check figure, you have good (though not perfect) assurance that the calculations have been done correctly.

TO SUMMARIZE: Process costing involves five steps: (1) determine the amount of “work done” (equivalents units of production) during the processing time period, (2) compute the product costs per unit by dividing total costs by “work done,” (3) compute the total cost of units completed and transferred out, (4) compute the total cost of units in ending work-in-process inventory, and (5) prepare the production cost report. With process costing, both units and costs must be transferred from one process center to the next until the final unit cost is accumulated at the end of the total production process. The production cost report provides a method of accounting for the flow of units and costs between process centers.

Understand the difficulty, yet importance, of having accurate product cost information. It is usually easy to associate direct materials and direct labor costs with specific products. However, it is very difficult, and often even arbitrary, to assign overhead costs to specific products. Hence, it is difficult to accurately determine the cost of products because overhead costs have to be estimated before being incurred; they often cannot be easily assigned to units produced; and they are often “lumpy”—that is, overhead costs typically do not follow the same even flow pattern of production and service output as followed by direct materials and direct labor. Regardless of the difficulty, however, having accurate product cost information is critical for management to make good planning, controlling, and evaluation decisions.

Explain the flow of goods and services in a manufacturing organization and follow the corresponding accumulation of product costs in the accounting system. In a manufacturing firm, employees work with raw materials to make finished goods to be sold to customers. When purchased, raw materials are stored in a raw materials warehouse as raw materials inventory; as they are manufactured, goods move through the factory floor as work-in-process inventory; when completed, goods are stored in a finished goods warehouse as finished goods inventory. The costs of direct materials and direct labor (factory employees who work directly in production) are combined with manufacturing overhead costs as goods are being produced to make up the cost of finished goods. The process of tracing manufacturing costs to specific goods typically follows an accounting method traditionally known as job order costing. When a manufacturing firm purchases materials, the costs are recorded in a raw materials inventory account. As direct materials are used, costs are removed from this account and debited to Work-in-Process Inventory. Direct labor and manufacturing overhead costs are also debited to Work-in-Process Inventory. As units are completed, the costs in Work-in-Process Inventory are transferred to Finished Goods Inventory. When the units are sold, the costs are transferred to Cost of Goods Sold. Whereas direct materials and direct labor costs assigned to products are actual costs, manufacturing overhead is transferred to Work-in-Process Inventory and assigned to products on the basis of some predetermined overhead rate.

Understand the process of accounting for overhead. Estimated manufacturing overhead costs for a period are determined at the beginning of the period and combined with an estimated level of activity (such as direct labor hours) to create the predetermined overhead rate that is used to allocate overhead costs to products as they are produced. As actual manufacturing overhead costs are incurred, they are debited to Manufacturing Overhead. This account is credited (and

review of learning objectives

1 Understand the difficulty, yet importance, of having accurate product cost information. It is usually easy to associate direct materials and direct labor costs with specific products. However, it is very difficult, and often even arbitrary, to assign overhead costs to specific products. Hence, it is difficult to accurately determine the cost of products because overhead costs have to be estimated before being incurred; they often cannot be easily assigned to units produced; and they are often “lumpy”—that is, overhead costs typically do not follow the same even flow pattern of production and service output as followed by direct materials and direct labor. Regardless of the difficulty, however, having accurate product cost information is critical for management to make good planning, controlling, and evaluation decisions.

2 Explain the flow of goods and services in a manufacturing organization and follow the corresponding accumulation of product costs in the accounting system. In a manufacturing firm, employees work with raw materials to make finished goods to be sold to customers. When purchased, raw materials are stored in a raw materials warehouse as raw materials inventory; as they are manufactured, goods move through the factory floor as work-in-process inventory; when completed, goods are stored in a finished goods warehouse as finished goods inventory. The costs of direct materials and direct labor (factory employees who work directly in production) are combined with manufacturing overhead costs as goods are being produced to make up the cost of finished goods. The process of tracing manufacturing costs to specific goods typically follows an accounting method traditionally known as job order costing. When a manufacturing firm purchases materials, the costs are recorded in a raw materials inventory account. As direct materials are used, costs are removed from this account and debited to Work-in-Process Inventory. Direct labor and manufacturing overhead costs are also debited to Work-in-Process Inventory. As units are completed, the costs in Work-in-Process Inventory are transferred to Finished Goods Inventory. When the units are sold, the costs are transferred to Cost of Goods Sold. Whereas direct materials and direct labor costs assigned to products are actual costs, manufacturing overhead is transferred to Work-in-Process Inventory and assigned to products on the basis of some predetermined overhead rate.

3 Understand the process of accounting for overhead. Estimated manufacturing overhead costs for a period are determined at the beginning of the period and combined with an estimated level of activity (such as direct labor hours) to create the predetermined overhead rate that is used to allocate overhead costs to products as they are produced. As actual manufacturing overhead costs are incurred, they are debited to Manufacturing Overhead. This account is credited (and
Work-in-Process Inventory is debited) as overhead costs are applied to specific jobs on the basis of the predetermined rate. At the end of the period, if total applied manufacturing overhead costs are larger (smaller) than total actual manufacturing overhead costs, the manufacturing overhead account will have a credit (debit) balance, indicating that manufacturing overhead costs were overapplied (underapplied). The debit or credit balance in the manufacturing overhead account is either closed directly to Cost of Goods Sold or allocated among Cost of Goods Sold, Finished Goods Inventory, and Work-in-Process Inventory.

4. Create a Cost of Goods Manufactured schedule and understand how it is used to calculate cost of goods sold. The computation of cost of goods sold can be quite complex for manufacturing organizations because the computation involves combining information about materials, labor, and overhead costs, as well as adjusting for beginning and ending inventory balances in raw materials, work-in-process, and finished goods. The Cost of Goods Manufactured schedule is used as an important input into the calculation of cost of goods sold. More importantly, the Cost of Goods Manufactured schedule is used as an important management tool for planning, controlling, and evaluating manufacturing costs.

5. Explain the flow of goods and services in a merchandising organization and follow the corresponding accumulation of product costs in the accounting system. Manufacturers sell to large-scale wholesalers, who then sell to retailers, who then sell to the end-user customers. These interconnected business relationships are called a distribution channel. Within this system, wholesalers and retailers are the merchants who are most concerned with effectively managing the costs involved in the inventory movement along the distribution channel. Because merchants basically purchase inventory in a finished state, the process of accounting for inventory in a merchandising business is not nearly as complicated as it is in a manufacturing business. As inventory is purchased, it is essentially ready for resale. Although there is often some effort expended to make some final preparations of the inventory for the customer, merchants will rarely assign additional costs of materials, labor, and overhead to specific products. Hence, inventory is debited to the merchandise inventory account as it is purchased. These costs are then directly transferred to the cost of goods sold account as merchandise is sold. In contrast to manufacturing (and service) organizations, there is little need for merchants to involve the complexities of tracking labor and overhead costs into a work-in-process account.

6. Explain the flow of goods and services in a service organization and follow the corresponding accumulation of product costs in the accounting system. Essentially, a service business is any organization whose main economic activity involves producing a nonphysical product that provides value to a customer. As service industries have deregulated in the last few decades, increased competition has forced these companies to develop better cost management systems. There are a number of similarities between accounting for service organizations and accounting for manufacturing organizations. Although most service firms do not need to manage large investments in raw materials, some firms do have large investments in partially completed service projects and contracts. Partially completed service jobs require management accounting that is very similar to the process of accounting for work-in-process in manufacturing firms. Supplies, direct labor, and overhead costs accumulate in an account called Work-in-Process Services. This account performs the same function as Work-in-Process Inventory in a manufacturing firm. In addition, as service activities take place, overhead is applied to Work-in-Process Services using a predetermined overhead application rate. When the firm has completed and delivered the contracted service, the relevant costs are transferred from Work-in-Process Services to Cost of Services (an account similar to the cost of goods sold account used by manufacturing and merchandising firms).

7. Understand the impact of e-business on product costing. As a result of the growth of e-business being conducted on the Internet, accountants and managers are experiencing tremendous change in the way business is conducted across all types of organizations (manufacturing, merchandising, and service). These changes in business processes are also dramatically changing the size of (and the process of managing) all three types of product costs, i.e., direct materials, direct labor, and overhead.

8. Use the FIFO method to do process costing. Process costing involves five steps: (1) Identify units that went into the process and identify where those units are at the end of the processing time. Determine the amount of “work done” (equivalent units of production) during the processing time period. (2) Determine the amount of production costs that went into the process and compute the product costs per unit for the processing time period. (3) Compute the total cost of units completed and transferred out (cost of goods manufactured) during the processing time period. (4) Compute the total cost of units that remain in process (ending work-in-process inventory) at the end of the processing time period. (5) Prepare the production cost report. The production cost report provides unit cost data that are used to cost inventory as it transfers from one process center to the next and to cost the ending work-in-process inventory of each process center.
activity-based costing (ABC), 120
channel, 136
Cost of Goods Manufactured schedule, 134
cycle times, 117
estimated manufacturing overhead, 130
finished goods inventory, 122
inventory turnover (stockturns), 115
job order costing, 123
logistics, 138
manufacturing organizations, 116
merchandising organizations, 116
overapplied manufacturing overhead, 132
predetermined overhead rate, 128
raw materials inventory, 122
retailers, 138
service organizations, 116
underapplied manufacturing overhead, 132
wholesalers, 138
work-in-process inventory, 122
conversion costs, 152
equivalent units of production, 150
process costing, 150
production cost report, 154

Job Order Costing
Salem Manufacturing Company applies manufacturing overhead costs on the basis of direct materials costs. The year 2006 estimates are:

Direct materials costs .......................................................... $300,000
Manufacturing overhead ...................................................... 180,000

For every dollar of direct materials costs, 60 cents of overhead is applied ($180,000 ÷ $300,000 = $0.60).

Following are the Salem Manufacturing Company transactions for 2006 (entries rounded to the nearest dollar):

a. Purchased materials for cash, $500,000.
   Raw Materials Inventory .............................................. 500,000
   Cash ...................................................................... 500,000
   Purchased raw materials.

b. Issued $400,000 of materials to production (80% direct, 20% indirect).
   Work-in-Process Inventory ........................................ 320,000
   Raw Materials Inventory ........................................ 80,000

c. Incurred direct labor costs of $250,000.
   Work-in-Process Inventory ........................................ 250,000

   d. Incurred indirect labor costs of $70,000.
      Work-in-Process Inventory ........................................ 70,000

   e. Incurred costs for administrative and sales salaries of $70,000 and $60,000, respectively.
      Administrative and Sales Salaries ............................... 130,000

   f. Incurred manufacturing overhead costs: property taxes on manufacturing plant, $6,000; plant utilities, $14,000; insurance on plant and equipment, $3,000. (Assume these expenses have not yet been paid.)
      Manufacturing Overhead ..................................... 23,000

   g. Recorded depreciation on manufacturing plant and equipment of $18,000 and $6,000, respectively.
      Manufacturing Plant ............................................. 24,000

   h. Applied manufacturing overhead.
      Manufacturing Overhead ..................................... 23,000

   i. Transferred 65% of Work-in-Process Inventory to Finished Goods Inventory. Beginning Work-in-Process Inventory was $13,000.
      Work-in-Process Inventory ........................................ 8,450
      Finished Goods Inventory ..................................... 8,450

   j. Sold 90% of finished goods on account at a markup of 60% of cost. There was no beginning inventory of finished goods.
      Sales ................................................................. 475,200
      Cost of Goods Sold .............................................. 283,200

   k. Closed the balance in Manufacturing Overhead to Cost of Goods Sold.
      Manufacturing Overhead ..................................... 108,000
      Cost of Goods Sold .............................................. 108,000

Required:
Prepare a journal entry for each transaction.

Solution
a. Raw Materials Inventory ........................................... 500,000
   Cash ................................................................. 500,000
   Purchased raw materials.
b. Manufacturing Overhead ........................................ 80,000
   Work-in-Process Inventory .................................. 320,000
   Raw Materials Inventory .................................. 400,000
   *Issued materials to production.

c. Work-in-Process Inventory .................................... 250,000
   Wages Payable (or Cash) .................................. 250,000
   *Incur direct labor costs.

d. Manufacturing Overhead ........................................ 70,000
   Wages Payable (or Cash) .................................. 70,000
   *Incur indirect labor costs.

e. Salaries Expense, Administrative ................................ 70,000
   Salaries Expense, Sales ..................................... 60,000
   Salaries Payable (or Cash) ................................ 130,000
   *Incurred sales and administrative salaries expense.

f. Manufacturing Overhead ........................................ 23,000
   Property Taxes Payable ...................................... 6,000
   Utilities Payable ............................................ 14,000
   Insurance Payable ........................................... 3,000
   *Incurred manufacturing overhead costs.

g. Manufacturing Overhead ........................................ 24,000
   Accumulated Depreciation—Plant .............................. 18,000
   Accumulated Depreciation—Equipment ........................ 6,000
   *Recorded depreciation on plant and equipment.

h. Work-in-Process Inventory ...................................... 192,000
   Manufacturing Overhead ..................................... 192,000*
   *Applied manufacturing overhead to Work-in-Process Inventory.

   *The predetermined overhead rate is equal to estimated total manufacturing overhead divided by estimated direct materials costs ($180,000 ÷ $300,000), or 60% of direct materials costs. In this case, $192,000 ($320,000 × 0.60) is applied because direct materials costs were $320,000 ($400,000 × 0.80).

i. Finished Goods Inventory ..................................... 503,750
   Work-in-Process Inventory .................................. 503,750*
   Transferred Work-in-Process Inventory to Finished Goods Inventory (0.65 × $775,000).

   *The amount transferred is determined as follows:

   **Work-in-Process Inventory**

<table>
<thead>
<tr>
<th>Beginning Balance</th>
<th>(b) 320,000</th>
<th>(c) 250,000</th>
<th>(h) 192,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) 775,000</td>
<td>(j) 250,000</td>
<td>(k) 192,000</td>
<td></td>
</tr>
<tr>
<td>Ending Balance</td>
<td>271,250</td>
<td>503,750*</td>
<td></td>
</tr>
</tbody>
</table>

j. Accounts Receivable ........................................... 725,400
   Sales .......................................................... 725,400*
   Cost of Goods Sold .......................................... 453,375*
   Finished Goods Inventory .................................. 453,375
   *Sold 90% of Finished Goods Inventory.

   *Because Finished Goods Inventory is $503,750 (i), Cost of Goods Sold is $453,375 ($503,750 × 0.90).
   Because Finished Goods Inventory is marked up 60%, Sales are $725,400 ($453,375 × 1.6).
k. Cost of Goods Sold ........................................ 5,000
   Manufacturing Overhead ................................ 5,000*

   Closed underapplied manufacturing overhead.

   *The amount of underapplied manufacturing overhead is determined as follows:

   Manufacturing Overhead
   \[
   \begin{align*}
   (b) & \quad 80,000 \\
   (d) & \quad 70,000 \\
   (f) & \quad 23,000 \\
   (g) & \quad 24,000 \\
   \text{Balance} & \quad 5,000
   \end{align*}
   \]

   Applied Overhead

Accounting for Overhead in a Service Business

Columbus & Hercules, a public accounting firm, is computing the overhead rates to use when billing customers and bidding on jobs. Columbus & Hercules provides the following estimates relating to overhead costs for the year 2006:

Utilities .................................................. $ 12,000
Rent ....................................................... 30,000
Equipment depreciation ................................ 22,000
Office supplies ......................................... 20,000
Support staff salaries ................................ 120,000
Total estimated overhead costs .................. $204,000

In addition, Columbus & Hercules offers the following annual estimates (based on a 50-week work year) regarding the salaries and estimated hours associated with the professionals employed by the firm:

<table>
<thead>
<tr>
<th>Position</th>
<th>Total Estimated Salaries</th>
<th>Total Estimated Billable Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partners (2 × $100,000)</td>
<td>$200,000</td>
<td>4,400</td>
</tr>
<tr>
<td>Managers (3 × $70,000)</td>
<td>210,000</td>
<td>6,600</td>
</tr>
<tr>
<td>Seniors (6 × $50,000)</td>
<td>300,000</td>
<td>13,200</td>
</tr>
<tr>
<td>Staff auditors (10 × $25,000)</td>
<td>250,000</td>
<td>22,000</td>
</tr>
</tbody>
</table>

Columbus & Hercules computes a chargeable hourly rate for each position that is the sum of the following: (1) each position’s hourly rate (based on salary), (2) an overhead rate, and (3) a markup of 20% of (1) and (2). The overhead rate allocates estimated overhead costs to each position, then relates the allocated costs to the hours expected to be worked by each position. Travel and materials costs are directly traceable and billed to each job.

Columbus & Hercules has no client projects in process on January 1, 2006. During January of 2006, Columbus & Hercules worked on several auditing and accounting jobs and incurred the following costs:

Jan. 1   Paid rent for January, $2,500.
       4   Purchased office supplies on account, $1,200.
       9   Paid $4,500 for payables from last year.
      15   Paid office support salaries, $5,000.
      15   Paid biweekly salaries of professionals: partners, $8,000; managers, $8,400; seniors, $12,000; staff, $10,000.
      15   Applied overhead costs based on billable hours: partners, 170 hours; managers, 270 hours; seniors, 500 hours; staff, 900 hours.
      18   Used office supplies totaling $800 to prepare client materials.
Jan. 21 Purchased office supplies on account, $1,100.
25 Received and paid invoice from office supply store for purchase on January 4.
27 Billed clients for the following jobs using the computed hourly rate for each position:

<table>
<thead>
<tr>
<th>Position</th>
<th>Job #1 Hours</th>
<th>Job #2 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner</td>
<td>90 hours</td>
<td>80 hours</td>
</tr>
<tr>
<td>Manager</td>
<td>150 hours</td>
<td>140 hours</td>
</tr>
<tr>
<td>Senior</td>
<td>320 hours</td>
<td>200 hours</td>
</tr>
<tr>
<td>Staff</td>
<td>560 hours</td>
<td>400 hours</td>
</tr>
</tbody>
</table>

27 Transferred costs from Work-in-Process Services to Cost of Services based on information from January 27.
31 Estimated utility costs for the month of January to be $1,000.
31 Paid office support salaries, $5,400.
31 Recognized depreciation of office equipment, $1,900.
31 Paid biweekly salaries of professionals: partners, $8,000; managers, $8,400; seniors, $12,000; staff, $10,000.
31 Applied overhead costs based on billable hours: partners, 180 hours; managers, 280 hours; seniors, 525 hours; staff, 950 hours.

**Required:**
1. Compute the billing rate to be used for each position.
2. Provide the journal entries made by Columbus & Hercules for January.
4. Compute the ending balance in Overhead.

**Solution**

1. **Billing rate**

   Overhead allocation rate: $204,000 \(\div\) $960,000 = $0.2125 per dollar of salary.

<table>
<thead>
<tr>
<th>Position</th>
<th>Estimated Salaries</th>
<th>Preliminary Rate</th>
<th>Allocated Overhead</th>
<th>Billable Hours</th>
<th>Overhead Rate per Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner</td>
<td>$200,000</td>
<td>$0.2125</td>
<td>$42,500</td>
<td>4,400</td>
<td>$9.66</td>
</tr>
<tr>
<td>Manager</td>
<td>$210,000</td>
<td>$0.2125</td>
<td>$44,625</td>
<td>6,600</td>
<td>6.76</td>
</tr>
<tr>
<td>Senior</td>
<td>$300,000</td>
<td>$0.2125</td>
<td>$63,750</td>
<td>13,200</td>
<td>4.83</td>
</tr>
<tr>
<td>Staff</td>
<td>$250,000</td>
<td>$0.2125</td>
<td>$53,125</td>
<td>22,000</td>
<td>2.41</td>
</tr>
<tr>
<td>Total</td>
<td>$960,000</td>
<td></td>
<td>$204,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Billable Rate for Each Position**

<table>
<thead>
<tr>
<th>Position</th>
<th>Hourly Rate</th>
<th>Overhead Rate</th>
<th>Markup</th>
<th>Billable Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner</td>
<td>$45.45(^1)</td>
<td>$9.66</td>
<td>$11.02</td>
<td>$66.13</td>
</tr>
<tr>
<td>Manager</td>
<td>31.82(^2)</td>
<td>6.76</td>
<td>7.72</td>
<td>46.30</td>
</tr>
<tr>
<td>Senior</td>
<td>22.73(^3)</td>
<td>4.83</td>
<td>5.51</td>
<td>33.07</td>
</tr>
<tr>
<td>Staff</td>
<td>11.36(^4)</td>
<td>2.41</td>
<td>2.75</td>
<td>16.52</td>
</tr>
</tbody>
</table>

\(^1\)$200,000 \(\div\) 4,400 hours = $45.45 per hour
\(^2\)$210,000 \(\div\) 6,600 hours = $31.82 per hour
\(^3\)$300,000 \(\div\) 13,200 hours = $22.73 per hour
\(^4\)$250,000 \(\div\) 22,000 hours = $11.36 per hour
### 2. Journal entries

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 1</td>
<td>Overhead</td>
<td>Cash: 2,500</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Paid rent for the month of January.</td>
</tr>
<tr>
<td>4</td>
<td>Office Supplies</td>
<td>Accounts Payable: 1,200</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Purchased office supplies on account.</td>
</tr>
<tr>
<td>9</td>
<td>Accounts Payable</td>
<td>Cash: 4,500</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Paid accounts payable from prior period.</td>
</tr>
<tr>
<td>15</td>
<td>Overhead</td>
<td>Cash: 5,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Paid office support salaries.</td>
</tr>
<tr>
<td>15</td>
<td>Work-in-Process Services</td>
<td>Cash: 38,400</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Paid salaries of professionals.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Partners: $8,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Managers: 8,400</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Seniors: 12,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff: 10,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total: $38,400</td>
</tr>
<tr>
<td>15</td>
<td>Work-in-Process Services</td>
<td>Overhead: 8,051</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Allocated overhead based on billable hours.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Partners—170 hours × 9.66</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Managers—270 hours × 6.76</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Seniors—500 hours × 4.83</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff—900 hours × 2.41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total: $8,051</td>
</tr>
<tr>
<td>18</td>
<td>Work-in-Process Services</td>
<td>Office Supplies: 800</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Used office supplies on behalf of clients.</td>
</tr>
<tr>
<td>21</td>
<td>Office Supplies</td>
<td>Accounts Payable: 1,100</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Purchased office supplies on account.</td>
</tr>
<tr>
<td>25</td>
<td>Accounts Payable</td>
<td>Cash: 1,200</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Paid for supplies purchased on January 4.</td>
</tr>
<tr>
<td>27</td>
<td>Accounts Receivable</td>
<td>Service Revenue: 57,724</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Billed clients for Jobs #1 and #2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Partners—170 hours × 66.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Managers—290 hours × 46.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Seniors—520 hours × 33.07</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff—960 hours × 16.52</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total: $57,724</td>
</tr>
<tr>
<td>27</td>
<td>Cost of Services</td>
<td>Work-in-Process Services: 48,107</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Transferred completed work in process to cost of services; comprised of each position’s hourly rate and overhead rate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Partners—170 hours × ($45.45 + 9.66)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Managers—290 hours × ($31.82 + 6.76)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Seniors—520 hours × ($22.73 + 4.83)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staff—960 hours × ($11.36 + 2.41)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total: $48,107</td>
</tr>
</tbody>
</table>
Jan. 31 Overhead .............................................. 1,000
Utilities Payable ........................................ 1,000
To record estimated utilities expense for the month.

31 Overhead .............................................. 5,400
Cash ..................................................... 5,400
Paid office support salaries.

31 Overhead .............................................. 1,900
Accumulated Depreciation—
Office Equipment ...................................... 1,900
To record depreciation expense for the month.

31 Work-in-Process Services ........................... 38,400
Cash ..................................................... 38,400
Paid salaries of professionals.
Partners $ 8,000
Managers 8,400
Seniors 12,000
Staff 10,000
Total $38,400

31 Work-in-Process Services ........................... 8,458
Overhead ................................................. 8,458
Allocated overhead based on billable hours.
Partners—180 hours × $9.66 $1,739
Managers—280 hours × $6.76 1,893
Seniors—525 hours × $4.83 2,536
Staff—950 hours × $2.41 2,290
Total $8,458

3. Ending balance in Work-in-Process Services

<table>
<thead>
<tr>
<th>Date</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/15</td>
<td>38,400</td>
</tr>
<tr>
<td>1/15</td>
<td>8,051</td>
</tr>
<tr>
<td>1/18</td>
<td>800</td>
</tr>
<tr>
<td>1/31</td>
<td>38,400</td>
</tr>
<tr>
<td>1/31</td>
<td>8,458</td>
</tr>
</tbody>
</table>

End. bal. 46,002

4. Ending balance in Overhead

<table>
<thead>
<tr>
<th>Date</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1</td>
<td>2,500</td>
</tr>
<tr>
<td>1/15</td>
<td>5,000</td>
</tr>
<tr>
<td>1/31</td>
<td>1,000</td>
</tr>
<tr>
<td>1/31</td>
<td>5,400</td>
</tr>
<tr>
<td>1/31</td>
<td>1,900</td>
</tr>
</tbody>
</table>

End. bal. 709
(overapplied)

**Process Costing**

Cleveland Enterprises produces flour in a continuous manufacturing process. The flour is mixed in one step and transferred to the finished goods department. At the beginning of September,
Cleveland had 1,600 bags of flour in process (100% complete as to materials and 20% complete as to processing) that held $2,800 in costs of direct materials and $800 in conversion costs. During September, 20,000 bags of flour were placed into production, and by the end of the month, only 2,000 bags of flour remained in process (100% complete as to materials and 30% complete as to processing). Production costs for September are as follows:

Direct materials .................................................. $36,000
Conversion costs ................................................ 47,712

Required:
1. Prepare the production cost report for September.
2. Prepare the journal entries required to record the production of flour and the transfer of the finished bags to finished goods inventory. Assume that the processing costs are 75% direct labor and 25% manufacturing overhead.

Solution
1. Production cost report

<table>
<thead>
<tr>
<th>Equivalent Units of Production</th>
<th>Direct Materials Costs</th>
<th>Conversion Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Physical Units</td>
<td>Percent Done</td>
</tr>
<tr>
<td>Beginning work-in-process</td>
<td>1,600</td>
<td>0%</td>
</tr>
<tr>
<td>Started and completed</td>
<td>18,000</td>
<td>100%</td>
</tr>
<tr>
<td>Ending work-in-process</td>
<td>2,000</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Equivalent units of production</strong></td>
<td><strong>20,000</strong></td>
<td></td>
</tr>
<tr>
<td>Transferred out</td>
<td>19,600</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product Costs Per Unit</th>
<th>Total Costs</th>
<th>Equivalent Units</th>
<th>Cost per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning work-in-process</td>
<td>$ 2,800</td>
<td>1,600</td>
<td>$1.75</td>
</tr>
<tr>
<td>Conversion costs</td>
<td>800</td>
<td>320</td>
<td>2.50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$ 3,600</strong></td>
<td><strong>320</strong></td>
<td><strong>$4.25</strong></td>
</tr>
<tr>
<td>Current period</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct materials costs</td>
<td>$36,000</td>
<td>20,000</td>
<td>$1.80</td>
</tr>
<tr>
<td>Conversion costs</td>
<td>47,712</td>
<td>19,880</td>
<td>2.40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$83,712</strong></td>
<td><strong>19,880</strong></td>
<td><strong>$4.20</strong></td>
</tr>
<tr>
<td><strong>TOTAL DOLLARS IN</strong></td>
<td><strong>$87,312</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Costs Transferred Out</th>
<th>Cost per Unit</th>
<th>Equivalent Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial direct materials costs</td>
<td>$ 2,800</td>
<td></td>
</tr>
<tr>
<td>Initial conversion costs</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>Costs to complete materials</td>
<td>$1.80</td>
<td>0</td>
</tr>
<tr>
<td>Costs to complete conversion</td>
<td>$2.40</td>
<td>1,280</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$ 6,672</strong></td>
<td></td>
</tr>
<tr>
<td>Started and completed</td>
<td><strong>$ 4.20</strong></td>
<td>18,000</td>
</tr>
<tr>
<td><strong>Total costs transferred out</strong></td>
<td><strong>$82,272</strong></td>
<td></td>
</tr>
</tbody>
</table>
**COSTS OF ENDING WORK-IN-PROCESS**

<table>
<thead>
<tr>
<th>Cost per Unit</th>
<th>Equivalent Units</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.80</td>
<td>2,000</td>
<td>$ 3,600</td>
</tr>
<tr>
<td>$2.40</td>
<td>600</td>
<td>1,440</td>
</tr>
<tr>
<td>$5,040</td>
<td></td>
<td>$ 5,040</td>
</tr>
</tbody>
</table>

**TOTAL DOLLARS OUT**: $87,312

---

### 2. Journal entries

- **Work-in-Process Inventory*** 36,000
- **Direct Materials Inventory*** 36,000
  - Transferred direct materials to work-in-process inventory.

- **Work-in-Process Inventory*** 47,712
- **Wages Payable*** 35,784
- **Manufacturing Overhead*** 11,928
  - To record the department’s payroll costs and applied manufacturing overhead ($47,712 × 75% = $35,784; $47,712 × 25% = $11,928).

- **Finished Goods Inventory*** 82,272
- **Work-in-Process Inventory*** 82,272
  - Transferred finished goods to the finished goods inventory.

---

### Discussion questions

1. Why do managers need accurate product cost information?
2. For financial reporting, which costs are usually included as product costs in a manufacturing company?
3. Why should a firm know how much it costs to produce its goods and services?
4. Describe some possible resources that organizations can use to help in the effort to improve quality while also reducing product costs.
5. Why is it difficult to track the costs of manufactured products?
6. What is the difference in the accounting treatment for direct materials and indirect materials?
7. Why are actual manufacturing overhead costs not assigned directly to products as they are incurred?
8. What is the normal flow of costs in a job order costing system?
9. What are some common bases for applying manufacturing overhead costs to products?
10. Why might Manufacturing Overhead be referred to as a “clearing account”?
11. How does a firm dispose of over- or underapplied overhead costs?
12. Cost of goods manufactured represents the costs being transferred out of the work-in-process account into the finished goods inventory account. Does the cost of goods manufactured calculation include actual manufacturing overhead costs or applied manufacturing overhead costs? Why does the Cost of Goods Manufactured schedule include both actual and applied manufacturing overhead costs?
13. What is the difference between a manufacturing company and a merchandising company? Between a merchandising company and a service company?
14. What does a distribution channel consist of?
15. What is a service organization?
16. Name three ways in which the service industry differs from the manufacturing industry.
17. What is the principal “product cost” for a service company?
18. Which three costs go into the work-in-process services account for a service company? How does this account differ between service and manufacturing firms?
19. What similarities and differences exist among the costs of merchandising, manufacturing, and service firms?
20. Should managers concentrate only on the costs of production (e.g., the cost of goods sold), or should they also consider other costs and factors?
21. What is the major difference between job order costing and process costing?
22. What two conditions generally exist for process costing to be appropriate?
23. What are the five steps involved in employing process costing?  

24. What is meant by the term “equivalent units of production”?

**Practice exercises**

**Practice 3-1**

**Importance of Accurately Identifying Product Costs**
Which one of the following statements is false?

a. A company wishing to enter a new market may decide not to enter the market because the prices charged by potential competitors are too low to allow the company to cover its costs.
b. Because gathering accurate cost data is so difficult, the benefits rarely outweigh the costs.
c. Having accurate cost information helps companies identify and eliminate costly processes or products.
d. Comparing budgeted costs with actual costs helps companies identify progress and problems of current projects.

**Practice 3-2**

**Manufacturing Overhead Components**
Which one of the following is not an example of manufacturing overhead?

a. Tires used in the assembly of cars  
b. Production supervisor’s salary  
c. Utilities for production plant  
d. Staples used in assembling furniture  
e. Insurance on assembly equipment

**Practice 3-3**

**Cost Flow Sequence**
Which one of the following sequences is the correct sequence for the flow of costs through a production process?

a. Raw materials inventory, work-in-process inventory, cost of goods sold, finished goods inventory  
b. Raw materials inventory, cost of goods sold, work-in-process inventory, finished goods inventory  
c. Raw materials inventory, work-in-process inventory, finished goods inventory, cost of goods sold  
d. Cost of goods sold, raw materials inventory, work-in-process inventory, finished goods inventory  
e. Raw materials inventory, finished goods inventory, cost of goods sold, work-in-process inventory

**Practice 3-4**

**Purchasing Raw Materials**
The company purchased plastic costing $20,000 and sheet metal costing $75,000. The company paid cash. Both of these materials are used in the production process. Make the necessary journal entry or entries to record these transactions.

**Practice 3-5**

**Direct Materials**
The company transferred plastic costing $4,000 and sheet metal costing $22,000 to the factory floor to be used as direct materials in production. Make the necessary journal entry or entries to record these transactions.

**Practice 3-6**

**Indirect Materials**
The company transferred plastic costing $1,400 and sheet metal costing $3,000 to the factory floor to be used in general maintenance projects. Because these materials will not be used in the production process itself, they are classified as indirect materials. Make the necessary journal entry or entries to record these transactions.
Practice 3-7  
**Direct Labor**  
Two workers worked six hours each to build a custom entertainment center. Each worker earns $12 per hour. Make the necessary journal entry to record this transaction. *Note:* The wages have not yet been paid in cash.

Practice 3-8  
**Indirect Labor**  
The company paid $4,500 to its production supervisor for her April salary. Make the necessary journal entry to record this transaction.

Practice 3-9  
**Recording Actual Manufacturing Overhead**  
The cost of certain overhead items for the month was as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent for production facility</td>
<td>$3,900</td>
</tr>
<tr>
<td>Insurance premium for the next month</td>
<td>$2,250</td>
</tr>
<tr>
<td>Monthly depreciation on equipment</td>
<td>$4,750</td>
</tr>
<tr>
<td>Repairs on equipment</td>
<td>$5,200</td>
</tr>
</tbody>
</table>

Payment for these items was as follows:

a. The company is required to pay for one year’s rent in advance. The total for one year is $46,800; this amount was paid three months ago. The $3,900 amount represents the rent applicable for this month.

b. The company is required to pay for six months’ insurance in advance. The total for six months is $13,500; this amount was paid two months ago. The $2,250 amount represents the insurance applicable for this month.

c. Depreciation is recognized on a straight-line basis.

d. The repairs were performed in the current month. The company will pay for the repairs next month.

Make the necessary journal entries to record these items.

Practice 3-10  
**Applying Manufacturing Overhead**  
The company used 150 direct labor hours to complete a certain job. The company applies manufacturing overhead based on direct labor hours at a rate of $5.75 per hour. Make the necessary journal entry to record the application of manufacturing overhead to this job.

Practice 3-11  
**Transferring the Cost of Completed Jobs**  
The total cost allocated to a job was $563. The company transferred this job to its finished goods warehouse. Make the necessary journal entry to record this transaction.

Practice 3-12  
**Transferring the Costs of Products That Are Sold**  
Refer to the data in Practice 3-11. The company sold for $1,000 the inventory produced in this job. Make the journal entry to record this transaction. The sale was on account. The company uses a perpetual inventory system.

Practice 3-13  
**Calculating Predetermined Overhead Rates**  
The company reports the following information from the budget for the coming year:

<table>
<thead>
<tr>
<th>Information</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated total amount of manufacturing overhead</td>
<td>$1,600,000</td>
</tr>
<tr>
<td>Average wage for production employees</td>
<td>$13.50</td>
</tr>
<tr>
<td>Estimated direct labors hours</td>
<td>250,000</td>
</tr>
<tr>
<td>Estimated machine hours</td>
<td>145,000</td>
</tr>
</tbody>
</table>

The company allocates manufacturing overhead based on direct labor hours. Compute the company’s predetermined overhead rate.
Practice 3-14

Over- and Underapplied Manufacturing Overhead
The company incurred $32,056 in manufacturing overhead and applied $32,537. The company uses the most common and simple method of handling differences between actual and applied overhead. Make the necessary journal entry to dispose of the difference.

Practice 3-15

Computing Cost of Goods Manufactured
Using the following information, compute cost of goods manufactured, which is the cost of inventory transferred to Finished Goods Inventory.

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work-in-process inventory, beginning balance</td>
<td>$124,500</td>
</tr>
<tr>
<td>Work-in-process inventory, ending balance</td>
<td>130,240</td>
</tr>
<tr>
<td>Direct materials costs</td>
<td>340,700</td>
</tr>
<tr>
<td>Direct labor costs</td>
<td>369,080</td>
</tr>
<tr>
<td>Actual manufacturing overhead costs</td>
<td>284,200</td>
</tr>
<tr>
<td>Applied manufacturing overhead costs</td>
<td>284,200</td>
</tr>
</tbody>
</table>

Practice 3-16

Cost of Goods Manufactured Schedule
Using the following information, prepare a cost of goods manufactured schedule.

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work-in-process inventory, beginning balance</td>
<td>$160,000</td>
</tr>
<tr>
<td>Work-in-process inventory, ending balance</td>
<td>180,000</td>
</tr>
<tr>
<td>Raw materials inventory, beginning balance</td>
<td>100,000</td>
</tr>
<tr>
<td>Raw materials inventory, ending balance</td>
<td>60,000</td>
</tr>
<tr>
<td>Raw materials purchased</td>
<td>540,000</td>
</tr>
<tr>
<td>Direct labor cost</td>
<td>600,000</td>
</tr>
<tr>
<td>Depreciation on factory building</td>
<td>100,000</td>
</tr>
<tr>
<td>Indirect labor</td>
<td>150,000</td>
</tr>
<tr>
<td>Other manufacturing overhead costs</td>
<td>86,000</td>
</tr>
<tr>
<td>Applied manufacturing overhead costs</td>
<td>330,000</td>
</tr>
</tbody>
</table>

Practice 3-17

Computing Cost of Goods Sold
Using the following information, compute cost of goods sold. Make sure to consider all necessary adjustments.

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finished goods inventory, beginning balance</td>
<td>$120,000</td>
</tr>
<tr>
<td>Finished goods inventory, ending balance</td>
<td>130,000</td>
</tr>
<tr>
<td>Cost of goods manufactured</td>
<td>340,000</td>
</tr>
<tr>
<td>Actual manufacturing overhead costs</td>
<td>160,000</td>
</tr>
<tr>
<td>Applied manufacturing overhead costs</td>
<td>175,000</td>
</tr>
</tbody>
</table>

Note: The $340,000 amount of cost of goods manufactured includes the $175,000 in applied manufacturing overhead.

Practice 3-18

The Flow of Goods and Costs in Merchandising Companies
Which one of the following is not an example of a way in which middlemen, such as wholesalers, add value?

a. Some manufacturers are not set up to deal with a large number of retail customers.
b. Wholesalers can provide retailers with inventory management services such as fast delivery, easy returns, and enhanced product mix.
c. Wholesalers are given special tax incentives by most state and local governments.
d. Wholesalers can efficiently break down large manufacturer product shipments into the small amounts needed by individual retailers.
e. Customers benefit from the diversity of products available in one retail location rather than going directly to a manufacturer for each product.
The Flow of Services and Costs in Service Companies
Which one of the following statements is false?

a. Service companies use predetermined overhead rates.
b. Service firms generally do not distinguish between manufacturing and administrative overhead costs.
c. Regarding the accounting for cost of “goods” sold, service companies are more similar to merchants than to manufacturers.
d. Service companies use work-in-process inventory accounts to accumulate costs such as direct labor and manufacturing overhead.
e. A service business is any organization whose main economic activity involves producing a nonphysical product.

Units Started and Completed
At the beginning of the month, the company had 35 units that were 45% complete in inventory. At the end of the month, the company had 50 units that were 80% complete in inventory. During the month, the company completed and transferred 1,200 units out of inventory. Compute the number of units started and completed during the month.

Equivalent Units of Production
Given the following information, compute the equivalent units of production.

<table>
<thead>
<tr>
<th>Physical Units</th>
<th>Percent Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning work-in-process</td>
<td>25</td>
</tr>
<tr>
<td>Started and completed</td>
<td>430</td>
</tr>
<tr>
<td>Ending work-in-process</td>
<td>35</td>
</tr>
</tbody>
</table>

Product Costs per Unit
Using the following information, compute the total product costs per unit for both beginning work-in-process inventory and for current period production.

<table>
<thead>
<tr>
<th>Total Costs</th>
<th>Equivalent Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning work-in-process direct materials costs</td>
<td>$2,840</td>
</tr>
<tr>
<td>Current period direct materials costs</td>
<td>7,400</td>
</tr>
<tr>
<td>Beginning work-in-process conversion costs</td>
<td>3,200</td>
</tr>
<tr>
<td>Current period conversion costs</td>
<td>21,700</td>
</tr>
</tbody>
</table>

Costs Transferred out of Work-in-Process Inventory
The company spent a total of $102,340 in the current period in one of its production centers. In addition, when the production period began, there was work-in-process inventory in the production center that had a total value of $3,820. If the costs of the inventory at the end of the period are $4,190, what are the total costs of the inventory transferred out of the production center?

Costs of Ending Work-in-Process Inventory
The company spent a total of $309,203 in the current period in one of its production centers. In addition, when the production period began, there was work-in-process inventory in
the production center that had a total value of $18,802. If the total costs of the inventory transferred out of the production center are $311,214, what are the costs of the inventory at the end of the period?

**Exercises**

**Exercise 3-1**

**Manufacturing Costs**

Springville Manufacturing Company uses a job order costing system. For Job #151, the production manager requisitioned $1,200 of direct materials and used 40 hours of direct labor at $18 per hour. Manufacturing overhead is applied on the basis of direct labor hours, using a predetermined overhead rate. At the beginning of the year, $800,000 of manufacturing overhead costs were estimated based on a forecast of 200,000 direct labor hours. Prepare a summary of the costs for Job #151. *(Note: You have to calculate the predetermined overhead rate.)*

**Exercise 3-2**

**Manufacturing Costs**

The Make-It-Right Company manufactures special wheelchairs for handicapped athletes. The company uses a job order costing system. Partial data for a particular job include:

<table>
<thead>
<tr>
<th></th>
<th>$450</th>
<th>375</th>
<th>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct labor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing overhead</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td><strong>$ ?</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The company allocates manufacturing overhead on the basis of direct labor hours. The estimated total manufacturing costs for the year are $750,000, and the total estimated direct labor hours are 150,000. Factory workers are paid $15 per hour.

1. Compute the predetermined manufacturing overhead rate.
2. What is the allocated manufacturing overhead cost and the total cost of the above referenced job?

**Exercise 3-3**

**Predetermined Manufacturing Overhead Rates**

Memphis Corporation uses a job order costing system and applies manufacturing overhead using a predetermined overhead rate. During the past three years, the following data have been accumulated:

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct labor hours</td>
<td>40,000</td>
<td>52,000</td>
<td>65,000</td>
</tr>
<tr>
<td>Machine hours</td>
<td>80,000</td>
<td>65,000</td>
<td>45,000</td>
</tr>
<tr>
<td>Direct materials costs</td>
<td>$400,000</td>
<td>$250,000</td>
<td>$390,000</td>
</tr>
<tr>
<td>Total budgeted manufacturing overhead</td>
<td>$80,000</td>
<td>$65,000</td>
<td>$45,000</td>
</tr>
</tbody>
</table>

1. What would the predetermined overhead rate be for each of the three years, if based on (a) direct labor hours, (b) machine hours, and (c) direct materials costs?
2. **Interpretive Question:** Which allocation basis would you recommend be used in the future for applying manufacturing overhead? Why?

**Exercise 3-4**

**Predetermined Manufacturing Overhead Rates**

East Lake Corporation uses a job order costing system and applies manufacturing overhead using a predetermined overhead rate. The following data are available for the past two years.
Direct labor hours ........................................... 104,000 130,000
Direct materials costs ........................................ $500,000 $780,000
Machine hours ................................................. 100,000 70,000
Total budgeted manufacturing overhead .................. $130,000 $90,000

1. Compute the predetermined overhead rate for each of the two years, based on (a) direct labor hours, (b) direct materials costs, and (c) machine hours.

2. Interpretive Question: Which allocation basis would you recommend for applying manufacturing overhead? Why?

Work-in-Process Analysis in a Manufacturing Organization
Matt Jones, a recently hired internal auditor, is currently auditing the work-in-process inventory account. Matt has forgotten some basic cost accounting concepts and asks for your assistance. Identify the four types of transactions or events that affect the work-in-process inventory account in a manufacturing organization. Prepare and explain a sample journal entry for each type of transaction.

Flow of Manufacturing Costs
Post the following cost data to the appropriate T-accounts to trace the flow of costs from the time they are incurred until the product is completed and sold. (Assume that purchases and expenses are credited to Cash or Accounts Payable.)

a. Direct materials purchased ................................ $ 60,000
b. Direct materials used ..................................... 50,000
c. Indirect materials purchased ............................. 9,000
d. Indirect materials used .................................... 7,000
e. Wages payable, direct .................................... 60,000
f. Wages payable, indirect .................................. 12,000
g. Selling and administrative expenses ................. 32,000
h. Actual manufacturing overhead costs other than
   indirect materials and indirect labor .................. 25,000
i. Manufacturing overhead applied ....................... 40,000
j. Work-in-process completed ............................. 120,000
k. Finished goods sold ...................................... 135,000

Applying Manufacturing Overhead
Keith Company has four manufacturing subsidiaries: W, X, Y, and Z. Each subsidiary keeps a separate set of accounting records. Manufacturing cost forecasts for 2006 for each subsidiary are:
### Subsidiaries

<table>
<thead>
<tr>
<th></th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials to be used (lbs.)</td>
<td>40,000</td>
<td>40,000</td>
<td>30,000</td>
<td>26,250</td>
</tr>
<tr>
<td>Direct labor hours</td>
<td>15,000</td>
<td>20,000</td>
<td>12,500</td>
<td>20,000</td>
</tr>
<tr>
<td>Direct labor costs</td>
<td>$6,000</td>
<td>$5,000</td>
<td>$1,875</td>
<td>$3,500</td>
</tr>
<tr>
<td>Machine hours</td>
<td>12,500</td>
<td>7,500</td>
<td>4,750</td>
<td>20,000</td>
</tr>
<tr>
<td>Manufacturing overhead</td>
<td>$30,000</td>
<td>$25,000</td>
<td>$10,000</td>
<td>$50,000</td>
</tr>
</tbody>
</table>

The predetermined overhead rates for each subsidiary are based on the following:

**Subsidiary W:** Machine hours  
**Subsidiary X:** Direct labor costs  
**Subsidiary Y:** Materials to be used  
**Subsidiary Z:** Direct labor hours

1. Compute the predetermined overhead rate to be used in 2006 by each subsidiary.  
2. If Subsidiary X actually had $4,000 of direct labor costs and $18,750 of manufacturing overhead, will overhead be over- or underapplied and by how much?  
3. If Subsidiary Y used 33,000 pounds of materials in 2006, what will be the applied manufacturing overhead?  
4. **Interpretive Question:** Identify the two most commonly used methods to dispose of under- or overapplied manufacturing overhead. What is the major advantage of each method?

### Applying Manufacturing Overhead

Valtec Company has three manufacturing divisions: A, B, and C. Each division has its own job order costing system and forecasts the following manufacturing costs for the year 2006:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials to be used (lbs.)</td>
<td>120,000</td>
<td>100,000</td>
<td>80,000</td>
</tr>
<tr>
<td>Direct labor hours</td>
<td>45,000</td>
<td>60,000</td>
<td>25,000</td>
</tr>
<tr>
<td>Machine hours</td>
<td>40,000</td>
<td>25,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Total budgeted manufacturing overhead</td>
<td>$50,000</td>
<td>$70,000</td>
<td>$45,000</td>
</tr>
</tbody>
</table>

The predetermined overhead rates for each division are based on the following:

**Division A:** Machine hours  
**Division B:** Materials to be used  
**Division C:** Direct labor hours

1. Compute the predetermined overhead rate to be used in 2006 by each division.  
2. If Division A actually had 37,000 machine hours and $49,000 of manufacturing overhead, will overhead be over- or underapplied and by how much?  
3. If Division B used 95,000 pounds of materials in 2006, what will be the applied manufacturing overhead?  
4. **Interpretive Question:** Of the two commonly used methods to dispose of over- or underapplied manufacturing overhead, which method would you recommend and why?

### Assigning Manufacturing Costs to Jobs

Farrer Manufacturing Company uses a job order costing system. All relevant information for Jobs #203 and #204, which were completed during May, is provided here. No other jobs were in process during the month of May.
Job #203 Job #204

<table>
<thead>
<tr>
<th></th>
<th>Job #203</th>
<th>Job #204</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials cost</td>
<td>$10,000</td>
<td>$13,000</td>
</tr>
<tr>
<td>Direct labor cost</td>
<td>$7,800</td>
<td>$10,800</td>
</tr>
<tr>
<td>Direct labor hours on job</td>
<td>800</td>
<td>1,400</td>
</tr>
<tr>
<td>Units produced</td>
<td>1,000</td>
<td>1,750</td>
</tr>
</tbody>
</table>

A predetermined overhead rate of $12 per direct labor hour is used to apply manufacturing overhead costs to jobs. Actual manufacturing overhead for the month of May totaled $25,000. All completed products are delivered to customers immediately after completion, so costs are transferred directly to Cost of Goods Sold without going through Finished Goods Inventory.

1. How much manufacturing overhead will be assigned to each job completed during May?
2. Compute the total cost of each job.
3. Compute the unit cost for each job.
4. Prepare the journal entries to transfer the cost of direct materials, direct labor, and manufacturing overhead to Work-in-Process Inventory and to transfer the cost of completed jobs to Cost of Goods Sold. (Omit explanations.)
5. Interpretive Question: How would the company have computed its predetermined overhead rate of $12 per direct labor hour? Explain.

Assigning Manufacturing Costs to Jobs

Remington Company uses predetermined overhead rates in assigning manufacturing overhead costs to jobs. The rates are based on machine hours in the machining department and on direct labor hours in the assembly department. Estimated costs, machine hours, and direct labor hours for the year in each department are:

<table>
<thead>
<tr>
<th></th>
<th>Machining</th>
<th>Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct labor cost</td>
<td>$64,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>Manufacturing overhead</td>
<td>$90,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>Direct labor hours</td>
<td>12,000</td>
<td>32,000</td>
</tr>
<tr>
<td>Machine hours</td>
<td>18,000</td>
<td>2,500</td>
</tr>
</tbody>
</table>

During the month of April, Job #402X had the following data for 50 completed units of product:

<table>
<thead>
<tr>
<th></th>
<th>Machining</th>
<th>Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials cost</td>
<td>$400</td>
<td>$700</td>
</tr>
<tr>
<td>Direct labor cost</td>
<td>$650</td>
<td>$2,300</td>
</tr>
<tr>
<td>Direct labor hours</td>
<td>120</td>
<td>740</td>
</tr>
<tr>
<td>Machine hours</td>
<td>900</td>
<td>80</td>
</tr>
</tbody>
</table>

1. What predetermined overhead rates would be used by the company in assigning manufacturing overhead costs to Job #402X in machining and in assembly? (Note: You should round all rates you calculate to two decimal places.)
2. Using the overhead rates you calculated in part (1), how much manufacturing overhead is applied to Job #402X?
3. What is the unit cost for Job #402X? (Round the unit cost to two decimal places.)

Analyzing Manufacturing Costs

The following T-accounts represent inventory costs as of December 31, 2006:

(continued)
Raw Materials Inventory | Finished Goods Inventory
--- | ---
Bal. 12/31/05 70,000 | Bal. 12/31/05 39,500
175,000 | 350,000

Bal. 12/31/06 45,000 | Bal. 12/31/06 53,000

Work-in-Process Inventory | Manufacturing Overhead
--- | ---
Bal. 12/31/05 12,500 | Bal. 12/31/05 24,500
200,000 | 26,000
124,500 | 30,000
86,000 | 36,000

Bal. 12/31/06 73,000

1. Determine the direct labor costs for 2006.
2. Determine the cost of goods manufactured for 2006.
4. Compute over- or underapplied manufacturing overhead for 2006.

**Exercise 3-12**

**Total Manufacturing Costs and Cost of Goods Manufactured**

The following information is for Kiev Derrald Company:

- Manufacturing overhead (actual) ........................................... $100,000
- Ending raw materials inventory .......................................... 12,000
- Manufacturing overhead (applied) ...................................... 95,000
- Beginning work-in-process inventory .................................. 55,000
- Manufacturing overhead (applied) ...................................... 40,000
- Ending work-in-process inventory ........................................ 47,000
- Beginning raw materials inventory ..................................... 10,000
- Direct labor costs .......................................................... 60,000
- Raw materials purchases .................................................. 40,000

1. Compute total manufacturing costs.
2. Compute cost of goods manufactured.

**Exercise 3-13**

**Total Manufacturing Costs, Cost of Goods Manufactured, and Cost of Goods Sold**

The following information is for MTC Harry Company:

- Beginning raw materials inventory .................................... $ 25,000
- Raw materials used in production as direct materials .............. 110,000
- Ending raw materials inventory ......................................... 40,000
- Manufacturing overhead (actual) ...................................... 300,000
- Beginning work-in-process inventory .................................. 150,000
- Ending work-in-process inventory ...................................... 180,000
- Direct labor costs .......................................................... 95,000
- Beginning finished goods inventory ................................... 71,000
- Ending finished goods inventory ........................................ 86,000
- Underapplied manufacturing overhead ................................. 19,000

1. Compute total manufacturing costs.
2. Compute cost of goods manufactured.
3. Compute cost of goods sold.
**Exercise 3-14**

**Service Cost Flows**
Xavier & Associates Law Firm estimated its total overhead costs for 2006 to be $1.8 million. It allocates overhead based on direct labor hours. Xavier employs a total of 11 attorneys, each working an average of 2,000 hours per year. The average annual salary for Xavier attorneys is $140,000, or approximately $70 per hour. Xavier attorneys worked a total of 23 hours and used $150 of supplies in doing work for Mr. Bailey, one of Xavier’s clients.

1. What is Xavier’s overhead rate?
2. Prepare the journal entry to record the overhead for the Bailey job.
3. Prepare the journal entry to record the cost of supplies for the Bailey job.
4. Prepare the journal entry to record the cost of labor for the Bailey job.

**Exercise 3-15**

**Service Cost Flows**
Pierce Engineers incurred (but has not yet paid) the following costs in 2006:

- Use of supplies for clients: $3,500
- Utilities: $8,000
- Property taxes: $12,000
- Engineers’ salaries: $100,000
- Support staff salaries: $35,000
- Applied overhead: $50,000

Prepare the journal entries to account for the costs given. Close the overhead account to Cost of Services.

**Exercise 3-16**

**Predetermined Service Overhead Rates**
The following data are available for Haul-It-Away Truckers:

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgeted direct labor hours</td>
<td>135,000</td>
<td>140,000</td>
</tr>
<tr>
<td>Planned number of moving jobs</td>
<td>300</td>
<td>310</td>
</tr>
<tr>
<td>Total miles to be driven</td>
<td>450,000</td>
<td>597,000</td>
</tr>
<tr>
<td>Total budgeted overhead</td>
<td>$900,000</td>
<td>$1,200,000</td>
</tr>
</tbody>
</table>

1. Compute the predetermined overhead rate for each of the two years, if based on (a) direct labor hours, (b) number of moving jobs, and (c) total miles driven.
2. **Interpretive Question:** Which allocation basis would you recommend for applying overhead? Why?

**Exercise 3-17**

**Applying Overhead**
Gammonomics Schools teaches private accounting courses. It applies overhead based on instructor hours. The following information was forecasted for 2006:

- Direct labor: $270,000
- Property tax on equipment: $2,700
- Supplies: $9,000
- Rent: $18,000
- Support staff salaries: $120,000
- Instructor hours: $16,000

1. Calculate the predetermined overhead rate for 2006.
2. If Gammonomics actually had 18,000 instructor hours and spent $150,000 on overhead, will overhead be under- or overapplied for 2006? By how much?
Exercise 3-18

**Service Costs**

The following information is available for a particular consulting contract performed by Newland Business Consultants in 2006:

- Consulting labor costs: $4,000
- Supplies: 500
- Overhead: ?
- Total cost: $?

Newland applies overhead on the basis of client consulting hours. The estimated total overhead costs for 2006 are $6.2 million, and the estimated total consulting hours are 150,000. Newland pays its consultants $40 per hour.

1. Compute the predetermined overhead rate.
2. What are the allocated overhead cost and the total cost of this particular contract?

---

Exercise 3-19

**Equivalent Units—Process Costing**

Assume that you are the owner and sole employee of a lube, oil, and filter service business that you run out of your home. Currently, you are running a spring special on a “super maintenance service” on cars. The maintenance service you offer is quite comprehensive and includes (among other things) changing the oil, rotating the tires, topping off all fluids, and washing and waxing each car. It takes about one to two hours to complete a car. With the great price you’re offering on this service, you immediately find yourself with about five days of customer order backlog. To catch up, you decide to spend the next week working solely on the “super maintenance service.” Further, you want to track your output to see if you can improve the amount of maintenance work you do each of the next five days.

When you come to work the following Monday, you have one car that is about 70% complete. At the end of the week, the results are as follows:

<table>
<thead>
<tr>
<th>Total Cars Completed</th>
<th>End-of-Day Car in Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each Day</td>
<td></td>
</tr>
<tr>
<td>Monday</td>
<td>5</td>
</tr>
<tr>
<td>Tuesday</td>
<td>5</td>
</tr>
<tr>
<td>Wednesday</td>
<td>7</td>
</tr>
<tr>
<td>Thursday</td>
<td>6</td>
</tr>
<tr>
<td>Friday</td>
<td>7</td>
</tr>
</tbody>
</table>

How much work did you get done each day? In other words, how many equivalent units of production did you have each day?

Exercise 3-20

**Equivalent Units and Unit Costs—Process Costing**

A large factory that manufactures wooden furniture has several assembly lines. One of the assembly lines is dedicated to assembly of wooden kitchen chairs. All raw materials necessary to complete each chair are requisitioned from the raw materials warehouse at the time each chair starts production on the assembly line. The following data relate to one week of production:

- Beginning Work-in-Process
  - 40 chairs; 80% complete; $350 in direct materials costs; $320 in conversion costs
Ending Work-in-Process
60 chairs; 40% complete

Current Week
550 chairs started and completed; $4,880 requisitioned from raw materials warehouse,
$5,820 incurred in conversion costs

1. Compute the equivalent units of production for both direct materials and conversion costs
   for the week.
2. Compute the total production cost per chair for the week on the assembly line.
3. How does this week’s production cost on the assembly line compare to last week’s produc-
   tion cost?

Equivalent Units and Unit Costs—Process Costing
Heidi Corporation began producing quick-drying paper cement in June 2006 (i.e., there was
no beginning work-in-process inventory on June 1). The manufacturing process involves only
one step. In June, the costs were $4,000 for direct materials and $3,108 for conversion costs.
During the month, 3,200 pounds of direct materials were placed in production. At the end of
June, 600 pounds of direct materials were still being processed and were 40% complete. Ass-
sume that all direct materials are added at the beginning of production.

1. Compute the number of equivalent units of output in terms of materials costs and labor
   and overhead (conversion) costs for June, assuming FIFO cost flow.
2. Determine the total cost of goods transferred to Finished Goods Inventory and the total cost
   of Work-in-Process Inventory at the end of June.

Exercise 3-21

Spreadsheet

Problem 3-1

Job Order Costing in a Manufacturing Organization—Journal Entries
Following are transactions for Montigo Manufacturing Company. Assume that the company
has no beginning work-in-process inventory.

1. Montigo purchased $600,000 of raw materials, paying 10% down, with the remainder to be
   paid in 10 days.
2. The production manager requisitioned $260,000 of materials (90% for direct use and the
   remainder for indirect purposes).
3. The liability incurred in (1) was paid in full.
4. 24,000 hours of direct labor and 2,000 hours of indirect labor were incurred. (Assume an
   average hourly wage rate of $9 for both direct and indirect labor.)
5. The following salaries were paid:
   Factory supervisor (a product cost) ........................................... $80,000
   Administrative executives ......................................................... 70,000
   Sales personnel ........................................................................ 90,000
6. Rent and utilities for the building of $30,000 and $7,000, respectively, were paid. Three-
   fourths of these expenses are applicable to manufacturing and the remainder to adminis-
   tration.
7. Depreciation on factory equipment was $15,000.
8. Advertising costs for the year totaled $15,000.
9. Manufacturing overhead is applied at a rate of $6.90 per direct labor hour.
10. All but $35,000 of Work-in-Process Inventory was completed and transferred to Finished
   Goods Inventory.

(continued)
11. The sales price of finished goods that were sold was 130% of manufacturing costs. Assume a perpetual inventory system and that all finished goods were sold.

12. Close over- or underapplied overhead directly to cost of goods sold.

**Required:**
Prepare journal entries for the transactions.

**Problem 3-2**

**Accounting For Manufacturing Transactions—Journal Entries**
Payson Company uses a job order costing system. The following is a partial list of the company’s accounts. (Note: Additional accounts may be needed.)

Cash
Manufacturing Overhead
Sales
Cost of Goods Sold
Sales Commissions Expense
Administrative Expenses
Accounts Receivable
Commissions Payable

**Required:**
1. Prepare journal entries for each of the following transactions (omit explanations).
2. Prepare T-accounts and post the journal entries to the T-accounts. Transaction (a) has been completed as an example.

   a. Raw materials previously purchased on account were paid for in cash, $700.

   ![Cash](a) 700  ![Accounts Payable](a) 700

   b. Raw materials were purchased for $1,500 on account.
   c. Direct labor costs of $3,000 were recorded.
   d. Direct materials costing $1,100 were issued directly to production.
   e. Depreciation of $1,500 on manufacturing equipment was recorded. (Assume this is a product cost.)
   f. Property taxes payable of $2,600 were recorded, half to manufacturing and half to administration.
   g. Manufacturing overhead costs of $400 were applied to a job in process.
   h. Materials previously purchased on account were paid for in cash, $1,500.
   i. Sales commissions of $240 were recorded.
   j. Goods costing $2,700 were transferred from Work-in-Process Inventory to Finished Goods Inventory.
   k. Finished goods costing $2,300 were sold for $3,200 on credit, and the cost of goods sold was recorded.

**Problem 3-3**

**Manufacturing Cost Flows**
Lehi Corporation uses a job order costing system in its manufacturing operation. For the year 2006, Lehi’s predetermined overhead rate was 75% of direct labor costs. For September 2006, the company incurred the following costs:

- Purchased raw materials on account .................................................. $ 70,000
- Issued raw materials to manufacturing process ........................................ 65,000
- Incurred direct labor costs ($10 per hour × 7,500 hrs.) ............................... 75,000
- Actual manufacturing overhead costs .................................................. 52,300
- Cost of goods completed and sold .................................................... 211,250

The company’s inventories at the beginning of September 2006 were as follows:
Raw materials .......................................................... $12,000
Work-in-process ......................................................... 57,500

The costs of all completed orders are transferred directly from Work-in-Process Inventory to Cost of Goods Sold.

**Required:**
1. Compute the following amounts.
   b. Over- or underapplied manufacturing overhead for the month of September.
2. Prepare journal entries to reflect the flow of costs into and out of Work-in-Process Inventory during September (omit explanations).

**Using T-Accounts: Cost Flows in a Job Order Manufacturing Organization**

High Country Furniture Company manufactures custom furniture only and uses a job order costing system to accumulate costs. Actual direct materials and direct labor costs are accumulated for each job, but a predetermined overhead rate is used to apply manufacturing overhead costs to individual jobs. Manufacturing overhead is applied on the basis of direct labor hours. In computing a predetermined overhead rate, the controller estimated that manufacturing overhead costs for 2006 would be $80,000 and direct labor hours would be 20,000. The following information is available for the year 2006:

a. Direct materials purchased, $22,000.
b. Direct materials used in production, $19,500.
c. Wages and salaries paid for the year: direct labor (18,000 hours), $117,000; indirect labor, $12,000; sales and administrative salaries, $21,000.
d. Depreciation on machinery and equipment, $9,000.
e. Rent and utilities for building (75% factory), $16,000.
g. Advertising costs, $12,000.
h. Manufacturing overhead is applied to Work-in-Process Inventory.
i. Eighty percent of Work-in-Process Inventory was completed and transferred to Finished Goods Inventory.

**Required:**
1. Compute the predetermined overhead rate at which manufacturing overhead costs will be applied to jobs.
2. Set up T-accounts and post the transactions.
3. Compute the under- or overapplied manufacturing overhead. Prepare a journal entry to close Manufacturing Overhead and transfer the balance to Cost of Goods Sold.

**Applying Manufacturing Overhead**

Swenson Corporation has four independent manufacturing divisions. The following data apply to the divisions for the year ended December 31, 2006:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials costs</td>
<td>$240,000</td>
<td>$280,000</td>
<td>$160,000</td>
<td>$130,000</td>
</tr>
<tr>
<td>Direct labor hours</td>
<td>80,000</td>
<td>60,000</td>
<td>48,000</td>
<td>28,000</td>
</tr>
<tr>
<td>Direct labor costs</td>
<td>$220,000</td>
<td>$130,000</td>
<td>$140,000</td>
<td>$84,000</td>
</tr>
<tr>
<td>Actual manufacturing overhead</td>
<td>$146,900</td>
<td>$205,400</td>
<td>$140,000</td>
<td>$33,000</td>
</tr>
<tr>
<td>Machine hours worked</td>
<td>40,000</td>
<td>12,000</td>
<td>28,000</td>
<td>16,000</td>
</tr>
<tr>
<td>Number of units produced</td>
<td>200,000</td>
<td>4,000</td>
<td>30,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Predetermined overhead rate</td>
<td>80% of direct labor costs</td>
<td>65% of direct materials costs</td>
<td>$3.30 per direct labor hour</td>
<td>$2.10 per machine hour</td>
</tr>
</tbody>
</table>

(continued)
**Required:**

1. For each of the four divisions, calculate:
   a. Applied manufacturing overhead.
   b. Over- or underapplied manufacturing overhead.
   c. Cost of goods manufactured, assuming no work-in-process inventories.
   d. Average cost per unit produced.

2. **Interpretive Question:** How would you recommend that the over- or underapplied manufacturing overhead be disposed of in each division? Why?

**Problem 3-6**

**Applying Manufacturing Overhead**

Openshaw Manufacturing Company made the following estimates at the beginning of the year:

<table>
<thead>
<tr>
<th></th>
<th>Department G</th>
<th>Department H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct labor costs</td>
<td>$219,000</td>
<td>$166,980</td>
</tr>
<tr>
<td>Manufacturing overhead</td>
<td>$86,700</td>
<td>$153,340</td>
</tr>
<tr>
<td>Machine hours</td>
<td>17,000</td>
<td>12,500</td>
</tr>
<tr>
<td>Direct labor hours</td>
<td>30,000</td>
<td>22,000</td>
</tr>
</tbody>
</table>

Manufacturing overhead is applied on the basis of machine hours in Department G and on the basis of direct labor hours in Department H. During the year, the following two jobs were completed (there were no jobs in process at the beginning or end of the year):

<table>
<thead>
<tr>
<th>Job #29</th>
<th>Department G</th>
<th>Department H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials used</td>
<td>$16,000</td>
<td>$9,200</td>
</tr>
<tr>
<td>Direct labor costs</td>
<td>$18,250</td>
<td>$14,420</td>
</tr>
<tr>
<td>Direct labor hours</td>
<td>2,500</td>
<td>1,900</td>
</tr>
<tr>
<td>Machine hours</td>
<td>1,410</td>
<td>1,080</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Job #30</th>
<th>Department G</th>
<th>Department H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials used</td>
<td>$17,500</td>
<td>$8,100</td>
</tr>
<tr>
<td>Direct labor costs</td>
<td>$19,710</td>
<td>$13,920</td>
</tr>
<tr>
<td>Direct labor hours</td>
<td>2,700</td>
<td>1,800</td>
</tr>
<tr>
<td>Machine hours</td>
<td>1,530</td>
<td>1,020</td>
</tr>
</tbody>
</table>

**Required:**

1. Compute the predetermined overhead rate for each department.
2. Determine the amount of manufacturing overhead to be applied to each job.
3. Determine the total cost of each job.
4. Given that the actual manufacturing overhead costs for the year in Departments G and H were $88,200 and $152,500, respectively; that the actual machine hours in Department G were 18,100; and that the direct labor hours in Department H were 21,600; compute the amount of over- or underapplied manufacturing overhead.
5. **Interpretive Question:** Why is the predetermined overhead rate based on estimated rather than actual information?

Brooks Manufacturing Company applies manufacturing overhead on the basis of direct materials costs. The estimates for 2006 were:

| Direct materials costs | $250,000 |
| Manufacturing overhead | 75,000   |

Following are the transactions of Brooks Manufacturing Company for 2006:

a. Raw materials purchased on account, $275,000 (80% for direct use and 20% for indirect use).
b. Raw materials issued to production, 80% for direct use and 20% for indirect use, for a total of $175,000.
c. Direct labor costs, $250,000.
d. Indirect labor costs, $25,000.
e. Administrative and sales salaries, $70,000 and $45,000, respectively.
f. Utilities, $10,500; plant depreciation, $20,000; maintenance, $7,500; miscellaneous administrative expenses, $2,000. (These costs are allocated on the basis of plant floor space—administrative facilities, 1,000 square feet; manufacturing, 5,000 square feet; sales facilities, 2,000 square feet.)
g. Manufacturing equipment depreciation, $6,000.
h. Additional raw materials issued to production for direct use, $125,000.
i. Manufacturing overhead is applied.
j. Recorded factory foreman’s salary, $27,000.
k. Ninety percent of existing Work-in-Process Inventory is transferred to Finished Goods Inventory. (Work-in-Process beginning inventory was $15,000.)
l. All finished goods are sold. (Assume no beginning inventory. Sales are marked up 40% of cost.)
m. Over- or underapplied manufacturing overhead is closed to Cost of Goods Sold.

Required:
1. Prepare a journal entry for each of the transactions and show the T-accounts for Manufacturing Overhead and Work-in-Process Inventory. (Assume that all manufacturing overhead is a product cost.)
2. What is the ending balance in the cost of goods sold account?

Unifying Concepts: Job Order Costing

Jones Custom Furniture Manufacturing, Inc., made the following estimates at the beginning of the year, 2006:

| Budgeted direct labor costs | $300,000 |
| Budgeted direct labor hours | 20,000   |
| Budgeted manufacturing overhead | $520,000 |

Jones applies manufacturing overhead to specific job orders on the basis of direct labor hours.

During the month of January, the following transactions occurred for Job #345, an order for 10 custom oak chairs, manufactured in the first week of January 2006:

Jan. 3 Requisitioned direct materials (lumber, fabric, paint), $876; put into production on Job #345.

(continued)
Jan. 3 Requisitioned indirect materials (glue, staples, sandpaper, and equipment grease), $154, for use in manufacturing the 10 chairs for Job #345, as well as other subsequent jobs.
7 Processed time card for Employee #214; 25 direct labor hours attributed to Job #345 at wage rate of $15 per hour.
7 Applied manufacturing overhead at the predetermined rate to Job #345, based on the actual direct labor hours.
7 Processed the manufacturing supervisor’s weekly salary of $1,000. (This salary is considered indirect labor because the supervisor oversees all jobs in process and does not account for her time on a job-by-job basis.)
7 Job #345 was completed and transferred to the finished goods warehouse to await shipment to the customer.
9 The 10 oak chairs (Job #345) were shipped to the customer. The sales invoice reflects a sales price of $3,000 on account.

In addition to Job #345, Jones completed 47 other job orders in January and had 7 others in process at month-end. The following information summarizes additional manufacturing transactions for Jones for the month of January (not relating to Job #345):

a. Raw materials purchased on account, $102,675.
b. Requisitioned raw materials to specific job orders, $90,430; 80% direct materials and the remainder indirect materials not directly attributable to any one specific job.
c. Incurred and paid direct labor wages totaled, $24,600; an average of $15 per hour for 1,640 total direct labor hours for January.
d. Applied manufacturing overhead at the predetermined rate to all jobs in progress on the basis of the actual direct labor hours incurred by job.
e. Incurred and paid supervisor salaries and other indirect manufacturing labor (e.g., maintenance labor) totaled, $7,000.
f. Incurred and paid the following costs associated with the manufacturing process and facility:

<table>
<thead>
<tr>
<th>Cost</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory rent</td>
<td>$7,600</td>
</tr>
<tr>
<td>Factory utilities</td>
<td>2,700</td>
</tr>
<tr>
<td>Insurance</td>
<td>1,200</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>1,900</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$13,400</strong></td>
</tr>
</tbody>
</table>

g. Recorded depreciation of manufacturing equipment for the month, $5,500.
h. The cost of the 47 jobs completed during the month totaled $125,446.
i. Shipped all completed jobs to customers by month-end at a total sales price of $200,714 on account.
j. Incurred and paid selling and administrative costs (e.g., administrative salaries, sales commissions, office supplies, office rent, etc.), $46,514.

**Required:**
1. a. Calculate Jones’ predetermined overhead rate for the year 2006.
b. Prepare journal entries for the first seven transactions (relating to Job #345). Omit explanations.
c. Determine the total cost of manufacturing each of the 10 oak chairs.
d. Determine the total gross margin earned on all 10 oak chairs.
2. Prepare the journal entries for transactions (a)–(j). Omit explanations.
3. Close Manufacturing Overhead to Cost of Goods Sold (include all transactions noted for Job #345).
4. Calculate Jones’ total gross margin for January, including Job #345.
5. Calculate Jones’ total operating income for January.
**Problem 3-9**

**Cost of Goods Manufactured**

The following data apply to Newton Company and Alexander Company (two independent companies):

<table>
<thead>
<tr>
<th></th>
<th>Newton Company</th>
<th>Alexander Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials inventory, January 1, 2006</td>
<td>$1</td>
<td>$4,000</td>
</tr>
<tr>
<td>Raw materials purchased</td>
<td>21,000</td>
<td>4</td>
</tr>
<tr>
<td>Raw materials inventory, December 31, 2006</td>
<td>6,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Manufacturing overhead (actual)</td>
<td>8,000</td>
<td>5</td>
</tr>
<tr>
<td>Manufacturing overhead (applied)</td>
<td>2</td>
<td>15,000</td>
</tr>
<tr>
<td>Selling and administrative expenses</td>
<td>14,000</td>
<td>25,000</td>
</tr>
<tr>
<td>Work-in-process inventory, January 1, 2006</td>
<td>3</td>
<td>20,000</td>
</tr>
<tr>
<td>Work-in-process inventory, December 31, 2006</td>
<td>16,000</td>
<td>22,000</td>
</tr>
<tr>
<td>Direct (raw) materials used in production</td>
<td>15,000</td>
<td>6</td>
</tr>
<tr>
<td>Direct labor costs</td>
<td>25,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Cost of goods manufactured</td>
<td>49,000</td>
<td>55,000</td>
</tr>
<tr>
<td>Overapplied (or underapplied) manufacturing overhead</td>
<td>(2,000)</td>
<td>4,000</td>
</tr>
</tbody>
</table>

**Required:**

Fill in the unknowns for the two cases. (*Hint:* Indirect materials are not used in either company.)

**Problem 3-10**

**Cost of Goods Manufactured Schedule**

*Note:* This problem is a continuation of Problem 3-7. Brooks Manufacturing Company’s journal entries and T-accounts for Manufacturing Overhead and Work-in-Process Inventory were completed in Problem 3-7. Assume that Brooks had the following beginning inventory amounts:

- Raw materials inventory: $80,000
- Work-in-process inventory: $15,000
- Finished goods inventory: $0

**Required:**

Prepare a Cost of Goods Manufactured schedule for 2006 for Brooks Manufacturing Company. Assume all beginning and ending raw materials amounts include only direct materials.

**Problem 3-11**

**Cost of Goods Manufactured Schedule**

Delta Manufacturing Company applies manufacturing overhead to jobs on the basis of machine hours. The 2006 estimates of manufacturing overhead and machine hours were:

- Manufacturing overhead: $1,825,000
- Machine hours: 365,000

Delta had the following transactions for October 2006:

a. Raw materials of $420,000 were purchased on account.

b. Raw materials of $400,000 were issued to production; 90% were direct materials, and the balance was indirect materials.

c. Direct labor costs incurred, $300,000.

d. Indirect labor costs incurred, $55,000.

e. Selling, general, and administrative expenses incurred, $150,000.

f. Manufacturing overhead costs incurred:

(continued)
Plant depreciation (factory) ........................................ $25,000
Equipment depreciation (factory) ............................... 14,000
Utilities (factory) .................................................. 7,000
Factory maintenance .............................................. 9,000
Factory taxes and insurance .................................. 5,000
Miscellaneous manufacturing overhead ..................... 6,000

g. Machine hours for the month, 30,400.
h. Eighty-five percent of Work-in-Process Inventory was transferred to Finished Goods Inventory. Assume that beginning Work-in-Process Inventory amounted to $95,000.
i. All finished goods are sold for cash at a 20% markup over costs of production. (There is no beginning or ending finished goods inventory.)
j. Over- or underapplied manufacturing overhead is charged to Cost of Goods Sold, and the overhead account is closed.

Required:
1. Prepare journal entries to reflect the flow of costs incurred during October.
2. Assuming that beginning raw materials inventory was $16,000 and beginning work-in-process inventory was $95,000, prepare a Cost of Goods Manufactured schedule for October 2006.

Problem 3-12

Analysis of Manufacturing Cost Flows
The following T-accounts represent manufacturing cost flows for Kanton Manufacturing Company for the year 2006.

<table>
<thead>
<tr>
<th>Direct Materials Inventory</th>
<th>Work-in-Process Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1 70,000 210,000</td>
<td>1/1 80,000 250,000</td>
</tr>
<tr>
<td>12/31 30,000</td>
<td>12/31 80,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Finished Goods Inventory</th>
<th>Manufacturing Overhead</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1 90,000 700,000</td>
<td>30,000 140,000</td>
</tr>
<tr>
<td>12/31 50,000</td>
<td></td>
</tr>
</tbody>
</table>

Required:
1. Compute the following amounts for 2006:
   a. Direct labor cost.
   b. Cost of goods manufactured.
   c. Cost of goods sold.
   d. Actual manufacturing overhead costs.
4. Interpretive Question: Explain how the over- or underapplied manufacturing overhead is usually accounted for.

Problem 3-13

Computing Overhead Rates and Client Billing in a Service Firm
Sutherland Estimating Company employs three professional estimators, each having a different specialty. John Spencer specializes in structural estimating; Steve Ray, electrical estimating; and
Dave Eugene, mechanical estimating. The firm expects to incur the following operating costs for 2006; travel and materials costs are billed separately to clients:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office salaries and wages</td>
<td>$54,000</td>
</tr>
<tr>
<td>Office supplies</td>
<td>$30,000</td>
</tr>
<tr>
<td>Utilities and telephone</td>
<td>$23,100</td>
</tr>
<tr>
<td>Depreciation</td>
<td>$24,300</td>
</tr>
<tr>
<td>Taxes and insurance</td>
<td>$15,450</td>
</tr>
<tr>
<td>Miscellaneous expenses</td>
<td>$3,150</td>
</tr>
<tr>
<td><strong>Total estimated costs for 2006</strong></td>
<td><strong>$150,000</strong></td>
</tr>
</tbody>
</table>

The salaries and billable hours of the three estimators are expected to be as follows:

<table>
<thead>
<tr>
<th>Estimator</th>
<th>Expected Salary</th>
<th>Expected Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spencer</td>
<td>$90,000</td>
<td>1,900</td>
</tr>
<tr>
<td>Ray</td>
<td>$72,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Eugene</td>
<td>$63,000</td>
<td>1,850</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$225,000</strong></td>
<td><strong>5,750</strong></td>
</tr>
</tbody>
</table>

Required:
1. Compute the overhead cost rate that should be used for each of the estimators (based on the expected hours to be billed, with overhead cost rates varying in proportion to each estimator’s compensation) to ensure that the total expected operating costs for 2006 will be recovered from clients. (Hint: Allocate total estimated overhead costs to each estimator based on relative salaries, then relate the allocated costs to the hours expected to be worked by each estimator.)

2. Using the overhead cost rates determined in part (1), determine the costs associated with the firm’s work for Landslide Company with the following estimating services and related costs: Spencer, 150 hours; Ray, 60 hours; Eugene, 15 hours; transportation and supplies costs, $2,400.

**Problem 3-14**

Service Costing—Journal Entries
Following are transactions for Andersen Custodial, Inc. Assume the company’s beginning work-in-process services account balance is zero.

- a. Purchased supplies costing $5,000 for cash.
- b. Received and immediately paid a utility bill, $800.
- c. Used supplies costing $3,000 in doing work for a customer.
- d. Incurred and paid 3,000 hours of direct labor and 1,500 hours of indirect labor. The average hourly wage rate for both direct and indirect labor is $7.
- e. Made monthly rent payment, $2,000.
- f. Applied overhead at $4.50 per direct labor hour.
- g. Andersen bills its customers at a rate of $20 per direct labor hour. All work in process was moved to Cost of Services.
- h. Closed all under- or overapplied overhead to Cost of Services.

Required:
Prepare the journal entries for the above transactions.

**Problem 3-15**

Service Costing—Journal Entries
Blake Accounting Services has the following transactions. Its beginning work-in-process services account balance is zero.

- a. Purchased supplies costing $11,000 on account.
- b. Paid property tax, $20,000.

(continued)
c. Paid rent, $2,000; and utilities, $700.
d. Paid support staff salaries, $35,000.
e. Used supplies costing $9,000.
f. Paid direct labor salaries, $50,000. Average rate was $10 per hour.
g. Applied overhead at $11.50 per direct labor hour.
h. Transferred $100,000 from Work-in-Process to Cost of Services and billed customers for 4,500 hours of work. Blake bills its customers $40 per direct labor hour.
i. Closed under- or overapplied overhead to Cost of Services.

Required:
1. Prepare the journal entries for the above transactions.
2. Determine the ending balance in the work-in-process services account.

**Problem 3-16**

Allee Company had the following balances at the beginning of 2006:

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounts receivable</td>
<td>$44,000</td>
</tr>
<tr>
<td>Supplies</td>
<td>10,000</td>
</tr>
<tr>
<td>Work-in-process services</td>
<td>30,000</td>
</tr>
<tr>
<td>Accounts payable (related to supplies)</td>
<td>$7,000</td>
</tr>
<tr>
<td>Salaries and wages payable</td>
<td>70,000</td>
</tr>
<tr>
<td>Utilities payable</td>
<td>2,400</td>
</tr>
<tr>
<td>Rent payable</td>
<td>3,000</td>
</tr>
</tbody>
</table>

Allee estimates that its total 2006 overhead will amount to $400,000. It allocates overhead based on direct labor hours. Allee estimates that its total 2006 direct labor hours will be 100,000 hours. Because it produces monthly financial statements, Allee makes adjusting entries at the end of each month. However, over- or underapplied overhead is not closed to Cost of Services until the end of the year.

During January 2006, Allee had the following transactions:

Jan. 1  Paid rent. Allee has a three-year, $162,000 lease. Rent is payable on the first of each month.
3  Paid for all supplies purchased in 2005.
4  Paid all utilities payable from 2005.
7  Purchased supplies, $1,200.
10  Paid all salaries and wages payable from 2005. $46,000 was for direct labor; $24,000 was for indirect labor.
12  Used supplies, $900.
19  Collected $30,000 from a customer for services performed and billed in December 2005.
27  Used supplies, $2,600.
31  Paid all employees for January labor. Total direct labor costs for the month of January were $50,000, direct labor hours, 8,000. Indirect labor costs were $30,000.
31  Applied overhead for the month.
31  Estimated its January utility expenses to be $2,000.
31  Completed and billed jobs costing $80,000. The company billed customers $140,000.

**Required:**
1. Prepare all journal entries necessary for the month of January.
2. What is the balance in the work-in-process services account at the end of January?
3. Compute the balance in the overhead account on January 31.
FIFO Cost Flow—Process Costing

The cleaning division of Rulon Corn Company had the following data for January 2006:

<table>
<thead>
<tr>
<th>Tons</th>
<th>Percentage Completed</th>
<th>Direct Materials Costs</th>
<th>Conversion Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>80%</td>
<td>$12,750</td>
<td>$1,800</td>
</tr>
<tr>
<td>39,900</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>897,750</td>
<td></td>
<td>$897,750</td>
<td>189,072</td>
</tr>
<tr>
<td>900</td>
<td>30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39,600</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Required:**

1. Using the FIFO cost flow method, compute the per-ton cost of corn processed by the cleaning division in this period (all materials are in place at the beginning of the process).
2. Compute the cost of the 39,000 tons of corn that were started and completed during January.
3. Compute the cost of the ending work-in-process inventory.

**Problem 3-18**

FIFO Cost Flow—Process Costing

Western Oil Company has three process centers: drilling, processing, and distributing. During September 2006, the processing department had the following operating data:

<table>
<thead>
<tr>
<th>Barrels</th>
<th>Percentage Completed</th>
<th>Direct Materials Costs</th>
<th>Conversion Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,000</td>
<td>60%</td>
<td>$2,200</td>
<td>$4,200</td>
</tr>
<tr>
<td>36,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15,000</td>
<td>30%</td>
<td>33,150</td>
<td>88,410</td>
</tr>
<tr>
<td>40,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Required:**

All raw materials are put in place at the beginning of the operation in the processing department. Assuming a FIFO flow of costs, compute:

1. The “work done” for September (in equivalent units of production) for direct materials and for conversion costs.
2. The September cost per barrel of oil in the processing department.
3. The cost of all oil transferred to distributing.
4. The cost of ending work-in-process inventory in the processing department.

**Problem 3-19**

FIFO Cost Flow—Process Costing

The assembly department of Charles Manufacturing Company reported the following data for the month of August 2006:

(continued)
**Beginning inventory (75% complete)** 3,000

**Units transferred from prior department** 22,500

**Ending inventory (50% complete)** 4,500

**Cost of beginning inventory (prior department $18,300; assembly materials $11,250; assembly conversion $12,375)** 41,925

**Cost transferred in from prior department** 135,000

**Cost of materials used in assembly department** 67,500

**Conversion costs for August in assembly department** 117,600

**Total cost** 362,025

*(Note: Materials used in the assembly department are added at the beginning of the assembly process.)*

**Required:**

Prepare the production cost report for the assembly department. *(Note: The prior department’s manufacturing costs should be included in this department’s production cost report.)*

**Problem 3-20**

**Spreadsheet**

**Equivalent Units and FIFO Cost Flow—Process Costing**

Midtown Manufacturing Company has two process centers—manufacturing and assembly. The data that follow show the production and cost results for the manufacturing center for the month of July 2006:

**Production data:**

- Units in process, July 1 (materials 50% complete, conversion 40% complete) 500
- Units started in production 2,500
- Units in process, July 31 (materials 100% complete, conversion 60% complete) 700

**Cost data:**

- Units in process, July 1:
  - Direct materials $3,000
  - Conversion costs 6,400
- Direct materials used in July 27,500
- Conversion costs for July 73,080
- Total 109,980

*(Note: In this problem, materials are not added at the beginning of the manufacturing process.)*

**Required:**

Prepare the production cost report for the manufacturing center.

**Case 3-1**

**Packard, Inc.**

Packard, Inc., produces and sells mousetraps. The cost of a mousetrap can be broken down as follows:

- **Direct materials** $0.23
- **Direct labor** $0.09
- **Manufacturing overhead** $0.12
- **Cost per trap** $0.44
The traps are then sold for 120% of cost, or $0.53 each. The manufacturing overhead is applied based on direct labor costs and was computed at the beginning of the year using the following estimates:

| Estimated manufacturing overhead for the period | $540,000 |
| Estimated direct labor costs | 405,000 |
| Predetermined overhead rate (per direct labor dollar) | 1.33 |

For the first six months of the year, overhead costs of $272,000 were actually incurred. For that same time period, actual direct labor costs were $204,000. However, during the year several changes in the production process were made. As a result, by the midpoint of the year, expected manufacturing overhead costs have been significantly reduced below the original estimate of $540,000. Hence, for the last six months of the year, overhead costs are expected to be $225,000, and direct labor costs are expected to be $202,500.

1. What changes (if any) should be made in the predetermined manufacturing overhead rate for Packard, Inc.?
2. Assuming that per-unit direct materials and direct labor costs will remain the same for the last six months of the year, determine the new cost of a single mousetrap. Should the company reduce the price of its mousetraps? What factors would affect your decision?

1. Why might the previous branch manager have purchased from Walker Wholesalers when purchasing directly from various manufacturers, all of whom ensure prompt delivery. A comparative price list is as follows:

<table>
<thead>
<tr>
<th>Product</th>
<th>Gates Paper Manufacturers</th>
<th>Sturdychairs Manufacturers</th>
<th>Olsen Manufacturers</th>
<th>Illumination Manufacturers</th>
<th>Olsen Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lined paper</td>
<td>$0.25</td>
<td>$27.80</td>
<td>$12.50</td>
<td>$7.60</td>
<td>$15.40</td>
</tr>
<tr>
<td>Desk lamps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steno chairs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day planners</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

While examining past purchase invoices, you are perplexed to discover that despite the significantly higher prices, the previous branch manager had made most of his purchases from Walker Wholesalers.

1. Why might the previous branch manager have purchased from Walker Wholesalers when purchasing directly from the manufacturers is less expensive?
2. Why do wholesalers need to charge higher prices than manufacturers? Are they justified from the customers’ point of view?
3. Will you, the new branch manager, always purchase from the manufacturers? Why or why not?
Case 3-4
Service Cost Flows
The CPA firm you work for has just been hired by Phillips Attorneys at Law to perform an audit. In the process of the audit, you notice that Phillips’ accountant has been inconsistent in accounting for the company president’s salary. You notice that sometimes he has accounted for the company president’s salary as follows:

Overhead ........................................ 20,000
Salaries and Wages Payable .......... 20,000
To record the company president’s salary.

Other times, the accountant has debited Salaries and Wages Expense instead of Overhead. When you confront the accountant about the inconsistency, he gets somewhat defensive and says that it doesn’t matter which method is used because both methods result in an expense, and net income will be the same either way.

1. Assuming that the company president’s tasks are exclusively administrative, do you agree with the accountant? Why or why not?
2. Which journal entry is correct? Why?

Judgment calls

Judgment 3-1
You Decide: With advancements in the Internet and e-commerce, will retailers be important to the future success of businesses, or will their services be eliminated in order to decrease costs?
Companies such as AMAZON.COM and EBAY eliminated retailers altogether and have changed the way their customers shop. Amazon.com and Ebay have no physical store locations. Customers order their products over the Internet and pay shipping to have goods delivered to any location they choose. Amazon.com and Ebay are able to pass the extra savings on to the consumer in the form of lower prices. Will retailers be completely eliminated in 15 years? What do you think?

Judgment 3-2
You Decide: Should the costs associated with an uncompleted consulting project be classified as a work-in-process asset on the balance sheet, or should the cost be expensed on the income statement as a part of doing business?
Your marketing company has been working on a consulting project for a client. Your team has worked on the project for two months, and it is now year-end. The project will be completed by February of the next year, and the client has not yet been billed. For the financial statements, how should the project be classified?
Analyzing Real Company Information

Analyzing 3-1 (Microsoft)

1. Is MICROSOFT a service business, a manufacturing business, or a merchandising business? Explain.

2. Microsoft’s 2002 income statement (Appendix A) lists research and development expense of $4,379 billion for the year. The notes to the financial statements say that “research and development costs are expensed as incurred” in accordance with generally accepted accounting principles. Do you think that Microsoft treats R&D costs any differently in its internal accounting reports? Explain.

3. In its management’s discussion and analysis (Appendix A), Microsoft describes four primary segments that it uses to categorize its product revenue. What are these segments, and what are some of the familiar products or services within these revenue segments?

Analyzing 3-2 (Pump, Inc.)

Acquiring management accounting data on real companies can be a challenge because this information is generally highly proprietary and of significant competitive value. The cost data below are for a medium-size family-owned pump manufacturing business located in the Midwest. (This business chooses to remain anonymous in order to keep its competitors from using these data to compete against it.) We’ll refer to this company simply as Pump, Inc.

Pump, Inc., had reorganized much of its production into manufacturing “cells”: self-supervising work centers that produce complete products. The cell program was initiated because of a strategic decision (with no management accounting data to support it) to improve customer service. The financial impact of the program was unclear; the operational causes and the financial effects were murky. As a result, the management team at Pump, Inc., was having a difficult time evaluating the effects of its strategic decision to change most of the company to manufacturing cells. (Some of the production process continued to be organized as a typical production line, similar to what is demonstrated in the chapter.) The current year’s cost data are presented below in the standard format typically used by the management accountant for Pump, Inc.

<table>
<thead>
<tr>
<th>Typical Cost Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost Category</strong></td>
</tr>
<tr>
<td>Direct materials</td>
</tr>
<tr>
<td>Direct labor</td>
</tr>
<tr>
<td>Manufacturing overhead</td>
</tr>
<tr>
<td><strong>Total costs</strong></td>
</tr>
</tbody>
</table>

The management team, however, had a difficult time using the cost data in the typical format to effectively control and evaluate its reorganization decision. The management accountant was asked to reformat the data to make them more useful for the management team. After some analysis, the accountant decided to provide more detail by breaking down Manufacturing Overhead into subcategories organized by function: Indirect Materials, Indirect Labor, Factory Support, Occupancy Costs, and Non-Factory Support. The accountant also realized that she could divide all costs into two additional categories: People Costs (represent costs for wages and salaries) and Purchased Costs (represent costs for materials, supplies, and services acquired from outside agencies). The new report format is presented on the following page.

(continued)
Consider the two reports on cost data for Pump, Inc.

1. Do you think the new report format provides any additional information value for controlling and evaluating the decision to change most of the production process into manufacturing cells?

2. What costs do you think the management team at Pump, Inc., should pay careful attention to in its effort to better control costs in the production plant?

3. Most importantly, if you were on the management team at Pump, Inc., what additional data would you like to see the management accountant provide?

### International Case

**Management Accounting in France**

France has a well-developed set of financial accounting rules, as embodied in the *Plan Comptable Général* (PCG). The French PCG is comparable to U.S. GAAP. You may not have realized it, but the cost accounting for manufacturers we have studied in this chapter has a very clear connection to the way financial accounting is reported. Exhibit 1 in the text visibly demonstrates the difference between the production process and the administration process in a manufacturing organization. U.S. cost accounting makes a clear functional distinction between costs related to the production process (e.g., direct materials, direct labor, and manufacturing overhead) versus the administration process (e.g., selling costs and general administration costs). Further, Exhibit 3 demonstrates that the flow of direct materials costs and direct labor costs through the accounting system, as well as the allocation of manufacturing overhead costs, allows U.S. companies to determine product costs and easily compute cost of goods sold for financial reporting purposes. However, cost accounting (*comptabilité analytique*) in France is explicitly decoupled from financial accounting, as defined by the PCG. What this means is that the chart of accounts French companies use for cost accounting is completely different from the chart of accounts used for financial accounting. The reason is not necessarily because French companies perform cost accounting differently from U.S. companies, but that the nature of French financial accounting is quite different from financial accounting in the United States. The PCG requires financial accounting reports in France to organize and report costs by their inherent nature (materials, labor, depreciation, etc.). Costs are not assigned to products or to departments. Hence, one wouldn’t expect to see a French company report Cost of Goods Sold or Selling and General Administrative Expense.
Think about this for a moment. If costs are not being assigned to products, departments, or operations within the organization, how does the organization perform the management processes of planning, controlling, and evaluating? Actually, French companies do not have a tradition of using costs to manage their companies. In fact, the traditional phrase used in France to describe the techniques and practices of planning, control, and evaluation has been *contrôle de gestion*, literally, "management control." The absence of the word *comptabilité* (accounting) in this phrase is significant: it indicates that accounting numbers play a limited role in managerial reporting systems in France. Only very recently has the phrase *comptabilité de gestion* become more common. French business has had a long tradition of being led by engineers, not by accountants and financiers. Even today some 50% of managing directors in France are engineers by profession or training.

Costs are not being used as the main tool for managing companies in France. Given that a large number of the management executives of French companies have engineering backgrounds, how do French companies handle the management processes of planning, controlling, and evaluating (e.g., what kinds of numbers and reports might you expect to find in a French company)? Would you expect that French companies reconcile their *comptabilité analytique* systems with their financial accounting systems, as U.S. companies typically do?


### Ethics Case

**State Home Builders Inc.**

You have recently been hired as an accountant for the largest residential construction company in the state. Your primary responsibility is to track costs for each home being constructed. Tracking the costs for direct materials and direct labor is relatively straightforward. Materials requisitioned for each home site are carefully tracked, and the construction workers are very careful about assigning their time to the homes they work on.

Accounting for manufacturing overhead costs, on the other hand, presents quite a problem. In the past, overhead has been allocated on the basis of direct labor hours. As a result, because larger houses require more workers, those houses have been allocated a larger share of the overhead.

Your company was recently selected by the state to build a number of low-income housing complexes. The state has agreed to an arrangement whereby it will pay your costs plus a 10% profit. Construction of these low-income housing units will be relatively simple and will not require a great deal of materials or labor, compared to the average house the company builds.

At a meeting following the granting of the construction contract by the state, the production foreman proposes the following idea:

> Since the state has agreed to pay our costs plus 10%, the higher the costs on the project, the more money we make. What we need to do is to funnel as much of our costs as possible to this low-income housing project. Now I don’t want anyone to think I am proposing something unethical. I am not saying that we should charge the state for fictitious costs. What I am saying is that we should allocate as much overhead as possible to the low-income project. Therefore, I propose that we allocate overhead on a per-house basis with each house, regardless of size, being allocated the same amount of overhead.

*(continued)*
You have analyzed the activities that drive overhead costs and have found that bigger houses, in addition to requiring more direct materials and direct labor, require more inspections, more supervision, etc. You can see that most in attendance at the meeting are being persuaded by the production foreman’s idea. You slowly raise your hand. It takes about 10 seconds before all the voices quiet. You look around the table and see 10 of your colleagues staring at you. You open your mouth and...

1. What would you do in this situation? Is the overhead allocation method being proposed by the production foreman illegal? Is it unethical?
2. Suppose you argue that overhead should continue to be allocated on the basis of direct labor hours. After hearing your points, the group votes to go with the production foreman and allocate the overhead on a per-house basis. What would you do next?

Writing Assignment

Trends in Product Cost Relationships
The ratios among the three types of product costs have changed quite a bit over the last 150 years of business. Generally, costs of direct materials have consistently formed approximately 50% of total product costs for manufacturing firms. However, the ratio of direct labor costs has been decreasing with an offsetting increase in the ratio of manufacturing overhead costs. What kinds of costing challenges does this shift from direct costs to manufacturing overhead costs pose for a manufacturing company? What factors do you think have contributed to this trend? Do you think that the advent of e-business will significantly affect the amount or ratio of direct labor costs in manufacturing products? If so, how? Write a one- to two-page paper on this topic.

The Debate

When Does a Direct Materials Cost Turn into an Indirect Cost (e.g., Manufacturing Overhead)?
Consider your automobile. What costs would be considered direct materials? What costs would be considered indirect materials? Are the fender panels direct or indirect materials? Are the rivets that connect the fender to the frame direct or indirect materials? Are the headlights direct or indirect materials? Are the screws that hold the headlights in place direct or indirect materials? In light of the intense price competition that takes place in the automobile industry, these are important cost questions: direct materials are assigned to a specific automobile (or automobile model), while indirect materials are gathered together in the pool of manufacturing overhead costs and generally allocated across all types of automobiles in the manufacturing plant.

Divide your group into two teams.

- One team represents: “Rivets and screws should be treated as direct costs.” Prepare a two-minute oral argument supporting this view. Be careful that you don’t make too many quick assumptions. Tracking direct materials costs to specific product units or product lines can be a very expensive process in a complex manufacturing organization.
- The other team represents: “Rivets and screws should be treated as indirect costs.” Prepare a two-minute oral argument supporting this view. You must be careful that you don’t make too many quick assumptions. Before you say that rivets and screws are indirect because their costs are small, consider that the bigger automakers spend tens of millions of dollars each year on rivets and screws.
Internet Search

Wal-Mart

Access WAL-MART’s customer Web site at http://www.walmart.com. Sometimes Web addresses change, so if this address doesn’t work, access the Web site for this textbook (http://swain.swlearning.com) for an updated link.

Once you’ve gained access to the site, answer the following questions.

1. Use Wal-Mart’s Store Finder to find the store nearest you (look at the bottom of its homepage).
2. What is the current price on a hardback version of J. K. Rowling’s Harry Potter and the Order of the Phoenix (a popular children’s book)?

Now access Wal-Mart’s corporate Web site at http://www.walmartstores.com (you could also click on the “Wal-Mart Stores Info” link at the bottom of the customer Web site). Again, if this Web address should change, access the Web site for this textbook (http://swain.swlearning.com) for an updated link.

Once you’ve gained access to this site, answer the following questions:

3. In order to be a Wal-Mart supplier you would need to adhere to certain “Supplier Standards.” Although these standards are very detailed, what are the seven general areas of supplier standards?
4. Wal-Mart’s first non-U.S. store opened in December 1991. Where? How many Wal-Mart stores are operating outside of the United States? Which countries, other than the United States, now have Wal-Mart stores?