

# Activity-Based Costing



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## study objectives

After studying this chapter, you should be able to:

- 1 Recognize the difference between traditional costing and activity-based costing.
- 2 Identify the steps in the development of an activity-based costing system.
- 3 Know how companies identify the activity cost pools used in activity-based costing.
- 4 Know how companies identify and use cost drivers in activity-based costing.
- 5 Understand the benefits and limitations of activity-based costing.
- 6 Differentiate between value-added and non-value-added activities.
- 7 Understand the value of using activity levels in activity-based costing.
- 8 Apply activity-based costing to service industries.





## The ABCs of Doughnut Making—Virtual-Reality Style

**Super Bakery, Inc.**, created in 1990 by former Pittsburgh Steelers' running back Franco Harris, is a nationwide supplier of mineral-, vitamin-, and protein-enriched doughnuts and other baked goods to the institutional food market, primarily school systems. Super Bakery is a *virtual corporation*, in which only the core, strategic functions of the business are performed inside the company. The remaining activities—selling, manufacturing, warehousing, and shipping—are outsourced to a network of external companies.

Super Bakery draws these cooperating companies together and organizes the work flow. The goal is to add maximum value to the company while making the minimum investment in permanent staff, fixed assets, and working capital. The results are notable:

Super Bakery's sales have grown at an average annual rate of approximately 20% during much of its existence.

One of Super Bakery's challenges has been to control the cost of the outsourced activities. Management suspected a wide variation in the cost of serving customers in different parts of the country. Yet its traditional costing methods were spreading costs over the entire customer base. Each customer's order appeared to cost the same amount to complete. In actuality, orders with high profit margins were subsidizing orders with low profit margins. Super Bakery desired a system that would more accurately assign the costs of each order. With such a system, pricing could be improved.

The company looked at and eventually changed to a system that could identify the costs associated with the *activities* performed in the business—manufacturing, sales, warehousing, and shipping. The new activity-based costing system showed that the costs and profit margins on each sale vary significantly. Super Bakery is now able to track the profitability of each customer's account and the performance of outsourced activities. This doughnut maker, as a result, even knows the cost of the doughnut holes!

*Source:* Based on Tom R. V. Davis and Bruce L. Darling, "ABC in a Virtual Corporation," *Management Accounting* (October 1996), pp. 18–26.



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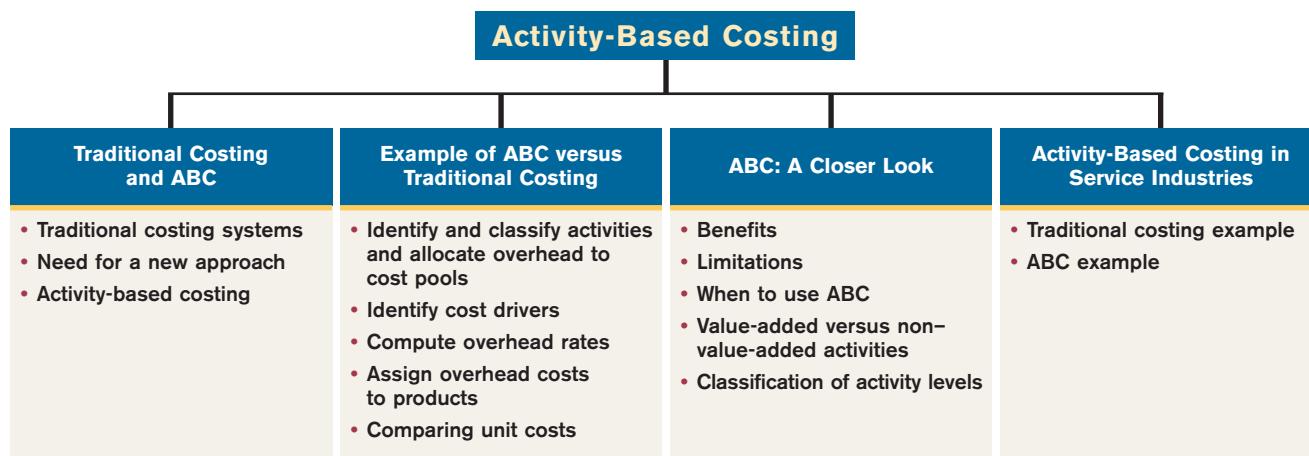
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## preview of chapter 4

As indicated in the Feature Story about **Super Bakery, Inc.**, the traditional costing systems described in earlier chapters are not the best answer for every company. Because Super Bakery suspected that the traditional system was masking significant differences in its real cost structure, it sought a new method of assigning costs. Similar searches by other companies for ways to improve operations and gather more accurate data for decision making have resulted in the development of powerful new management tools, including **activity-based costing (ABC)**. The primary objective of this chapter is to explain and illustrate this concept.

The content and organization of this chapter are as follows.



## Traditional Costing and Activity-Based Costing

### TRADITIONAL COSTING SYSTEMS

#### study objective 1

Recognize the difference between traditional costing and activity-based costing.

It is probably impossible to determine the *exact* cost of a product or service. However, in order to achieve improved management decisions, companies strive to provide decision makers with the most accurate cost estimates they can. The most accurate estimate of product cost occurs when the costs are traceable directly to the product produced or the service provided. Direct material and direct labor costs are the easiest to trace directly to the product through the use of material requisition forms and payroll time sheets. Overhead costs, on the other hand, are an indirect or common cost that generally cannot be easily or directly traced to individual products or services. Instead, companies use estimates to assign overhead costs to products and services.

Often the most difficult part of computing accurate unit costs is determining the proper amount of **overhead cost** to assign to each product, service, or job. In our coverage of job order costing in Chapter 2 and of process costing in Chapter 3, we used a single or plantwide overhead rate throughout the year for the entire factory operation. That rate was called the **predetermined overhead rate**. For job order costing, we assumed that **direct labor cost** was the relevant activity base for assigning all overhead costs to jobs. For process costing, we assumed that **machine hours** was the relevant activity base for assigning all overhead to the process or department.

The use of direct labor as the activity base made sense when overhead cost allocation systems were first developed. At that time, direct labor made up a large portion of total manufacturing cost. Therefore, it was widely accepted that

there was a high correlation between direct labor and the incurrence of overhead cost. As a result, direct labor became the most popular basis for allocating overhead.

Even in today's increasingly automated environment, direct labor is sometimes the appropriate basis for assigning overhead cost to products. It is appropriate to use direct labor when (a) direct labor constitutes a significant part of total product cost, and (b) a high correlation exists between direct labor and changes in the amount of overhead costs. Illustration 4-1 displays a simplified (one-stage) traditional costing system relying on direct labor to assign overhead.

### THE NEED FOR A NEW APPROACH

In recent years, manufacturers and service providers have experienced tremendous change. Advances in computerized systems, technological innovation, global competition, and automation have changed the manufacturing environment drastically. As a result, the amount of direct labor used in many industries has greatly decreased, and total overhead costs resulting from depreciation on expensive equipment and machinery, utilities, repairs, and maintenance have significantly increased. When there is not a correlation between direct labor and overhead, it is inappropriate to use plantwide predetermined overhead rates based on direct labor. Companies that use overhead rates based on direct labor, even though this correlation does not exist, experience significant product-cost distortions.

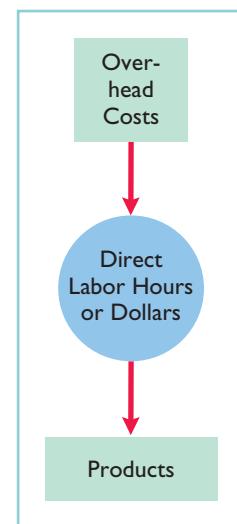
To avoid such distortions, many companies now use machine hours as the basis on which to allocate overhead in an automated manufacturing environment. But even machine hours may not suffice as the only plantwide basis for allocating all overhead. If the manufacturing process is complex, then only multiple allocation bases can result in more accurate product-cost computations. In such situations, managers need to consider an overhead cost allocation method that uses *multiple* bases. That method is **activity-based costing**.

### ACTIVITY-BASED COSTING

Broadly, **activity-based costing (ABC)** is an approach for allocating overhead costs. More specifically, ABC allocates overhead to multiple activity cost pools, and it then assigns the activity cost pools to products and services by means of cost drivers. To understand this more clearly, you need to apply some new meanings to the rather common-sounding words that make up the definition: In activity-based costing, an **activity** is any event, action, transaction, or work sequence that incurs cost when producing a product or providing a service. An **activity cost pool** is the overhead cost attributed to a distinct type of activity (e.g., ordering materials or setting up machines). A **cost driver** is any factor or activity that has a direct cause-effect relationship with the resources consumed. The reasoning behind ABC cost allocation is simple: **Products consume activities, and activities consume resources**.

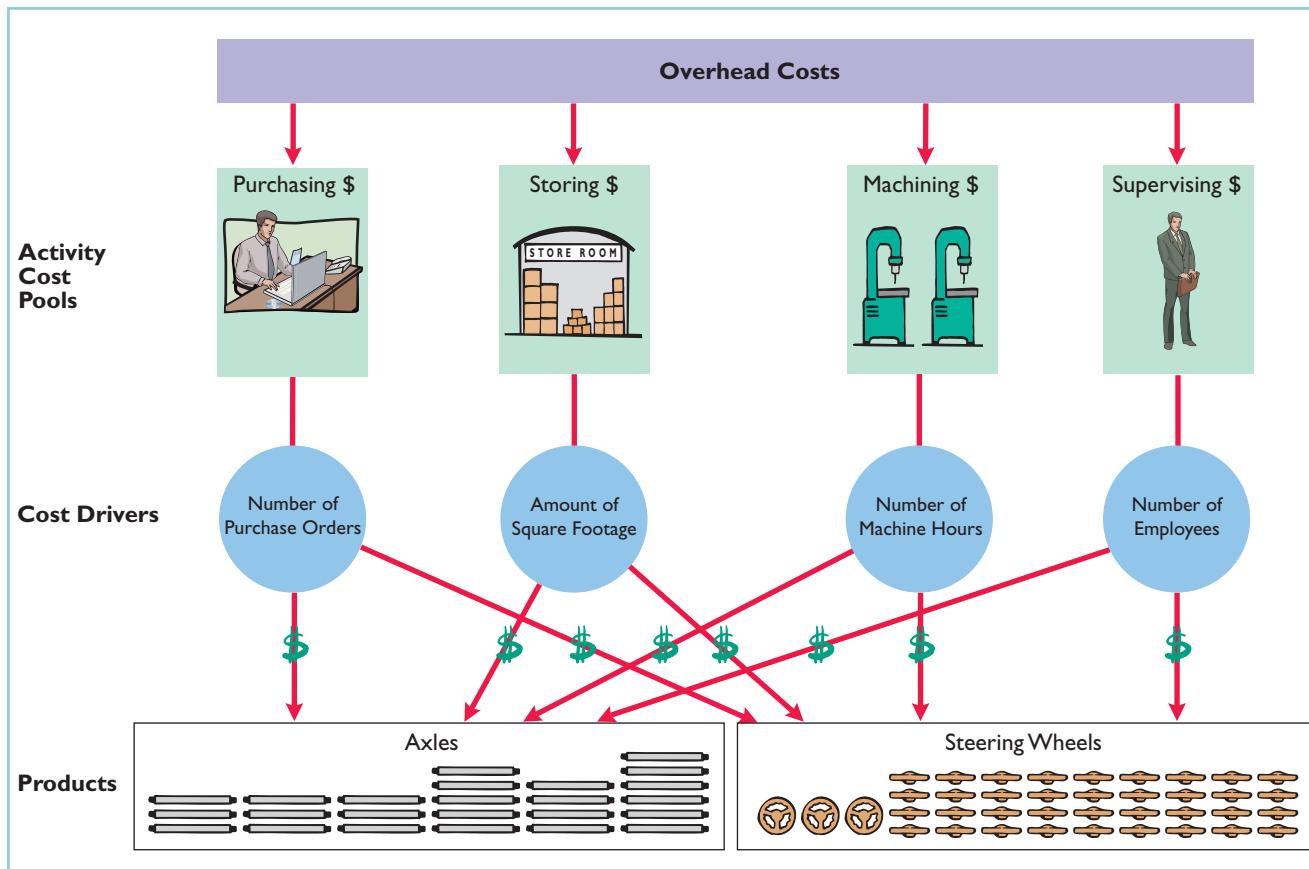
These definitions of terms will become clearer as we look more closely at how ABC works. ABC allocates overhead in a two-stage process. The first stage allocates overhead costs to activity cost pools. (Traditional costing systems, in contrast, allocate these costs to departments or to jobs.) Examples of overhead cost pools are ordering materials, setting up machines, assembling products, and inspecting products.

The second stage assigns the overhead allocated to the activity cost pools to products, using cost drivers. The cost drivers measure the number of individual activities undertaken or performed to produce products or provide services.



**Illustration 4-1**  
Traditional one-stage  
costing system

Examples are number of purchase orders, number of setups, labor hours, and number of inspections. Illustration 4-2 shows examples of activities, and possible cost drivers to measure them, for a company that manufactures two products—axles and steering wheels.

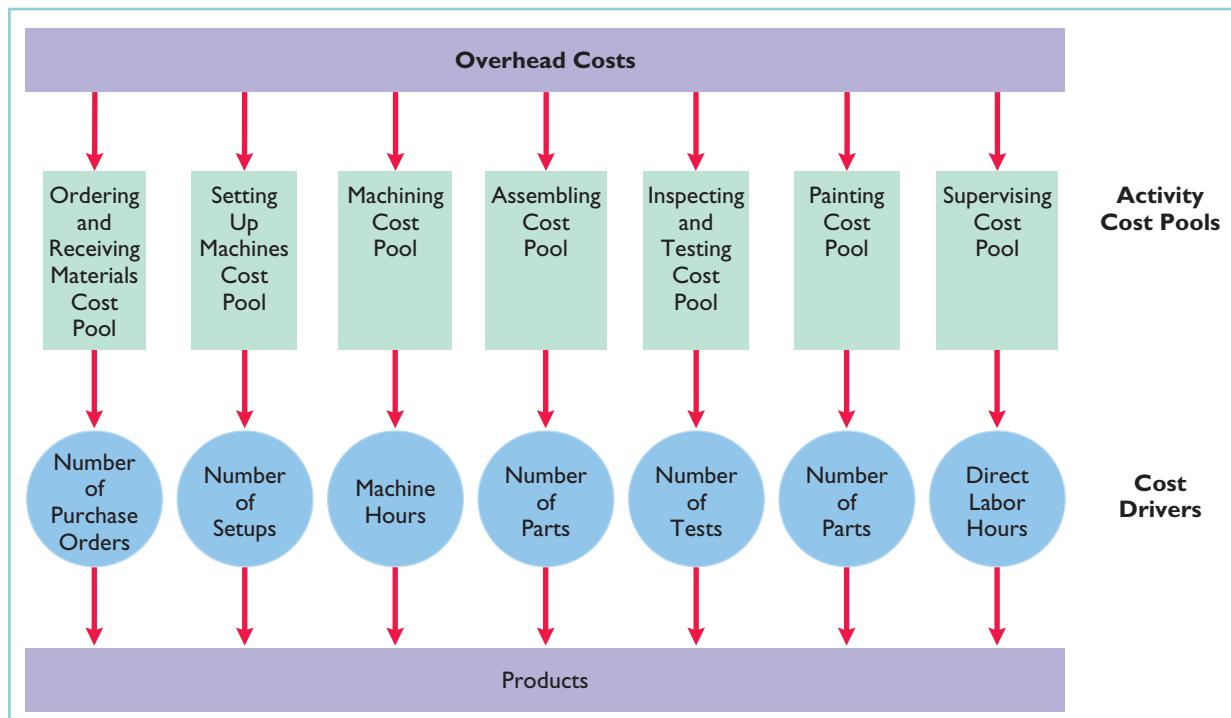


**Illustration 4-2**  
Activities and related cost drivers

In the first step (as shown at the top of Illustration 4-2), the company allocates overhead costs to activity cost pools. In this simplified example, the company has identified four activity cost pools: purchasing, storing, machining, and supervising. After the costs are allocated to the activity cost pools, the company uses cost drivers to determine the costs to assign to the individual products (either axles or steering wheels) based on each product's use of each activity. For example, if axles require more activity by the purchasing department, as measured by the number of required purchase orders, then more of the overhead cost from the purchasing pool will be allocated to the axles.

The more complex a product's manufacturing operation, the more activities and cost drivers it is likely to have. If there is little or no correlation between changes in the cost driver and consumption of the overhead cost, inaccurate product costs are inevitable.

Illustration 4-3 shows the design of a more complex activity-based costing system with seven activity cost pools for Lift Jack Company. Lift Jack Company manufactures two automotive jacks—an automobile scissors jack and a truck hydraulic jack.



**Illustration 4-3**  
ABC system design—Lift Jack Company

The Lift Jack Company illustration contains seven activity cost pools. In some companies the number of activities can be substantial. For example, Clark-Hurth (a division of **Clark Equipment Company**), a manufacturer of axles and transmissions, identified over 170 activities. **Compumotor** (a division of **Parker Hannifin**) identified over 80 activities in just the procurement function of its Material Control Department.

#### before you go on...

### Do it!

Indicate whether the following statements are true or false.

1. A traditional costing system allocates overhead by means of multiple overhead rates.
2. Activity-based costing allocates overhead costs in a two-stage process.
3. Direct material and direct labor costs are easier to trace to products than overhead.
4. As manufacturing processes have become more automated, more companies have chosen to allocate overhead on the basis of direct labor costs.
5. In activity-based costing, an activity is any event, action, transaction, or work sequence that incurs cost when producing a product.

### Solution

1. false. 2. true. 3. true. 4. false. 5. true.

Related exercise material: **BE4-1**, **BE4-2**, **E4-1**, and **Do it! 4-1**.

### Costing Systems

#### Action Plan

- Understand that a traditional costing system allocates overhead on the basis of a single predetermined overhead rate.
- Understand that an ABC system allocates overhead to identified activity cost pools, and then assigns costs to products using related cost drivers that measure the resources consumed.



## Example of ABC versus Traditional Costing

In this section we present a simple case example that compares activity-based costing with traditional costing. It illustrates how ABC eliminates the distortion that can occur in traditional overhead cost allocation. As you study this example,

#### study objective 2

Identify the steps in the development of an activity-based costing system.

you should understand that ABC does not *replace* an existing job order or process costing system. What ABC does is to segregate overhead into various cost pools in an effort to provide more accurate cost information. As a result, ABC supplements—rather than replaces—these cost systems.

Assume that Atlas Company produces two automobile antitheft devices, The Boot and The Club. The Boot is a high-volume item totaling 25,000 units annually. The Club is a low-volume item totaling only 5,000 units per year. The direct materials cost per unit is \$40 for The Boot and \$30 for The Club. The direct labor cost is \$12 per unit for each product. Each product requires one hour of direct labor for completion. Therefore, total annual direct labor hours are 30,000 ( $25,000 + 5,000$ ). Expected annual manufacturing overhead costs are \$900,000. Thus, the predetermined overhead rate under traditional costing, using direct labor hours, is \$30 ( $\$900,000 \div 30,000$ ) per direct labor hour. Since both products require one direct labor hour per unit, both products are allocated overhead costs of **\$30 per unit under traditional costing**.

Let's now calculate unit costs under ABC. Activity-based costing involves the following four steps.

1. Identify and classify the major activities involved in the manufacture of specific products, and allocate manufacturing overhead costs to cost pools.
2. Identify the cost driver that has a strong correlation to the costs accumulated in the cost pool.
3. Compute the overhead rate for each cost driver.
4. Assign manufacturing overhead costs for each cost pool to products, using the overhead rates (cost per driver).

### **IDENTIFY AND CLASSIFY ACTIVITIES AND ALLOCATE OVERHEAD TO COST POOLS (STEP 1)**

#### **study objective 3**

Know how companies identify the activity cost pools used in activity-based costing.

A well-designed activity-based costing system starts with an analysis of the activities performed to manufacture a product or provide a service. This analysis should identify all resource-consuming activities. It requires documenting every activity undertaken to accomplish a task. Atlas Company identified three activity-cost pools: setting up machines, machining, and inspecting.

Next, the system assigns overhead costs directly to the appropriate activity cost pool. For example, all overhead costs directly associated with Atlas Company's machine setups (such as salaries, supplies, and depreciation) would be assigned to the machine setup cost pool. Illustration 4-4 shows the three cost pools, along with the estimated overhead allocated to each cost pool.

**Illustration 4-4** Activity cost pools and estimated overhead

<b>Activity Cost Pools</b>	<b>Estimated Overhead</b>
Setting up machines	<b>\$300,000</b>
Machining	<b>500,000</b>
Inspecting	<b>100,000</b>
Total	<b>\$ 900,000</b>

### **IDENTIFY COST DRIVERS (STEP 2)**

#### **study objective 4**

Know how companies identify and use cost drivers in activity-based costing.

After costs are allocated to the activity cost pools, the company must identify the cost drivers for each cost pool. The cost driver must accurately measure the actual consumption of the activity by the various products. To achieve accurate costing, a **high degree of correlation** must exist between the cost driver and the actual consumption of the overhead costs in the cost pool.

Illustration 4-5 shows the cost drivers identified by Atlas and their total expected use per activity cost pool.

Activity Cost Pools	Cost Drivers	Expected Use of Cost Drivers per Activity
Setting up machines	Number of setups	1,500 setups
Machining	Machine hours	50,000 machine hours
Inspecting	Number of inspections	2,000 inspections

**Illustration 4-5**  
Cost drivers and their expected use

Availability and ease of obtaining data relating to the cost driver is an important factor that must be considered in its selection.

### COMPUTE OVERHEAD RATES (STEP 3)

Next, the company computes an **activity-based overhead rate** per cost driver by dividing the estimated overhead per activity by the number of cost drivers expected to be used per activity. Illustration 4-6 shows the formula for this computation.

$$\frac{\text{Estimated Overhead per Activity}}{\text{Expected Use of Cost Drivers per Activity}} = \text{Activity-Based Overhead Rate}$$

**Illustration 4-6** Formula for computing activity-based overhead rate

Atlas Company computes its activity-based overhead rates by using estimated overhead per activity cost pool, shown in Illustration 4-4, and the expected use of cost drivers per activity, shown in Illustration 4-5. These computations are presented in Illustration 4-7.

Activity Cost Pools	Estimated Overhead	÷	Expected Use of Cost Drivers per Activity	=	Activity-Based Overhead Rates
Setting up machines	\$300,000		1,500 setups		\$200 per setup
Machining	500,000		50,000 machine hours		\$10 per machine hour
Inspecting	100,000		2,000 inspections		\$50 per inspection
Total	<u>\$900,000</u>				

**Illustration 4-7**  
Computation of activity-based overhead rates

### ASSIGN OVERHEAD COSTS TO PRODUCTS (STEP 4)

In assigning overhead costs, it is necessary to know the expected use of cost drivers **for each product**. Because of its low volume, The Club requires more set-ups and inspections than The Boot. Illustration 4-8 shows the expected use of cost drivers per product for each of Atlas's products.

Activity Cost Pools	Cost Drivers	Expected Use of Cost Drivers per Activity	Expected Use of Cost Drivers per Product	
			The Boot	The Club
Setting up machines	Number of setups	1,500 setups	500	1,000
Machining	Machine hours	50,000 machine hours	30,000	20,000
Inspecting	Number of inspections	2,000 inspections	500	1,500

**Illustration 4-8**  
Expected use of cost drivers per product

To assign overhead costs to each product, Atlas multiplies the activity-based overhead rates per cost driver (Illustration 4-7, page 157) by the number of cost drivers expected to be used per product (Illustration 4-8, page 157). Illustration 4-9 shows the overhead cost assigned to each product.

**Illustration 4-9**

Assignment of activity cost pools to products

ATLAS COMPANY											
The Boot				The Club							
Activity Cost Pools		Expected Use of Cost Drivers per Product	Activity-Based Overhead Rates	=	Cost Assigned	Expected Use of Cost Drivers per Product	Activity-Based Overhead Rates	=	Cost Assigned		
Setting up machines		500	\$200	\$100,000	1,000	\$200	\$200,000				
Machining		30,000	\$10	300,000	20,000	\$10	200,000				
Inspecting		500	\$50	25,000	1,500	\$50	75,000				
Total costs assigned [(a)]				\$425,000							\$475,000
Units produced [(b)]				25,000							5,000
Overhead cost per unit [(a) ÷ (b)]				\$17							\$95
10											

Under ABC, the overhead cost per unit is \$17 for The Boot and \$95 for The Club. When compared to the \$30 per unit overhead charge under traditional costing, ABC shifts costs from the high-volume product (The Boot) to the low-volume product (The Club). This shift occurs because low-volume products often require more special handling, such as machine setups and inspections. This is true for Atlas Company. Thus, the low-volume product frequently is responsible for more overhead costs per unit than is a high-volume product.<sup>1</sup> Assigning overhead using ABC will usually increase the cost per unit for low-volume products as compared to a traditional overhead allocation. Therefore, traditional cost drivers such as direct labor hours are usually not appropriate for assigning overhead costs to low-volume products.

### COMPARING UNIT COSTS

Illustration 4-10 shows the unit cost for each product under traditional costing.

**Illustration 4-10**

Computation of unit costs—traditional costing

Manufacturing Costs	Products	
	The Boot	The Club
Direct materials	\$40	\$30
Direct labor	12	12
Overhead	30*	30*
Total unit cost	\$82	\$72

\*Predetermined overhead rate × Direct labor hours = \$30 × 1 hr. = \$30

A comparison of unit manufacturing costs under traditional costing and ABC shows the following significant differences.

<sup>1</sup>Robin Cooper and Robert S. Kaplan, "How Cost Accounting Distorts Product Costs," *Management Accounting* 69, No. 10 (April 1988), pp. 20–27.

<b>Manufacturing Costs</b>	<b>The Boot</b>		<b>The Club</b>	
	<b>Traditional Costing</b>	<b>ABC</b>	<b>Traditional Costing</b>	<b>ABC</b>
Direct materials	\$ 40	\$ 40	\$ 30	\$ 30
Direct labor	12	12	12	12
Overhead	30	17	30	95
Total cost per unit	<b>\$82</b>	<b>\$69</b>	<b>\$72</b>	<b>\$137</b>
	<b>Overstated \$13</b>		<b>Understated \$65</b>	

**Illustration 4-11**  
Comparison of unit product costs

The comparison shows that unit costs under traditional costing are significantly distorted. The cost of producing The Boot is overstated by \$13 per unit (\$82 – \$69), and the cost of producing The Club is understated by \$65 per unit (\$137 – \$72). These differences are attributable entirely to how Atlas Company assigns manufacturing overhead. A likely consequence of the differences in assigning overhead is that Atlas has been overpricing The Boot and possibly losing market share to competitors. It also has been sacrificing profitability by underpricing The Club.

Activity-based costing was pioneered in the United States: **John Deere Company** coined the term about 25 years ago. Numerous well-known U.S. companies, including **IBM**, **AT&T**, **Hewlett-Packard**, **Procter & Gamble**, **Tektronix**, **Hughes Aircraft**, **Caterpillar**, and **American Express**, have adopted ABC. Its use outside the United States, however, is limited. The cost of implementation may discourage some foreign companies.

In Japan, where activity-based costing is less widely used, companies prefer volume measures such as direct labor hours to assign overhead cost to products. Japanese managers are convinced that reducing direct labor is essential to continuous cost reduction. Using direct labor as the basis for overhead allocation forces Japanese companies to watch direct labor more closely. Possibly, Japanese management believes that labor cost reduction is more of a priority than developing more accurate product costs.



### Service Company Insight

#### Traveling Light

Have you flown on an airplane since the \$15 baggage fees have been implemented? Did the \$15 fee make you so mad that you swore that the next time you flew, you would pack fewer clothes so you could use a carry-on bag instead? That is exactly how the airlines hoped that you would react. Baggage handling is extremely labor-intensive. All that tagging, sorting, loading on carts, loading in planes, unloading, and sorting again add up to about \$9 per bag. They also have equipment costs: sorters, carts, conveyors, tractors, and storage facilities. That's about another \$4 per bag. Finally, there is additional fuel cost of a 40 pound item—about \$2 in fuel for a 3-hour flight. These costs add up to \$15 (\$9 + \$4 + \$2). Coincidence? Probably not. Since airlines have implemented their baggage fees, fewer customers are checking bags. Not only does this save the airlines money, it also increases the amount of space available for hauling cargo. An airline can charge at least \$80 for hauling a small parcel for same-day delivery service.

Source: Scott McCartney, "What It Costs an Airline to Fly Your Luggage," *Wall Street Journal Online*, November 25, 2008.



Why do airlines charge even higher rates for heavier bags, bags that are odd shapes (e.g., ski bags), and bags with hazardous materials in them?

before you go on...

**Apply ABC****Do it!**

Lift Jack Company, as shown in Illustration 4-3 (page 155) has seven activity cost pools and two products. It expects to produce 200,000 units of its automobile scissors jack and 80,000 units of its truck hydraulic jack. Having identified its activity cost pools and the cost drivers for each cost pool, Lift Jack Company accumulated the following data relative to those activity cost pools and cost drivers.

Annual Overhead Data		Estimated Overhead	Expected Use of Cost Drivers per Activity	Expected Use of Cost Drivers per Product	
Activity Cost Pools	Cost Drivers			Scissors Jacks	Hydraulic Jacks
Ordering and receiving	Purchase orders	\$ 200,000	2,500 orders	1,000	1,500
Machine setup	Setups	600,000	1,200 setups	500	700
Machining	Machine hours	2,000,000	800,000 hours	300,000	500,000
Assembling	Parts	1,800,000	3,000,000 parts	1,800,000	1,200,000
Inspecting and testing	Tests	700,000	35,000 tests	20,000	15,000
Painting	Parts	300,000	3,000,000 parts	1,800,000	1,200,000
Supervising	Direct labor hours	1,200,000	200,000 hours	130,000	70,000
		<u>\$6,800,000</u>			

Using the above data, do the following:

- Prepare a schedule showing the computations of the activity-based overhead rates per cost driver.
- Prepare a schedule assigning each activity's overhead cost to the two products.
- Compute the overhead cost per unit for each product.
- Comment on the comparative overhead cost per unit.

**Solution**

- (a) Computations of activity-based overhead rates per cost driver:

Activity Cost Pools	Estimated Overhead	÷	Expected Use of Cost Drivers per Activity	=	Activity-Based Overhead Rates
Ordering and receiving	\$ 200,000		2,500 purchase orders		\$80 per order
Machine setup	600,000		1,200 setups		\$500 per setup
Machining	2,000,000		800,000 machine hours		\$2.50 per machine hour
Assembling	1,800,000		3,000,000 parts		\$0.60 per part
Inspecting and testing	700,000		35,000 tests		\$20 per test
Painting	300,000		3,000,000 parts		\$0.10 per part
Supervising	1,200,000		200,000 direct labor hours		\$6 per direct labor hour
	<u>\$6,800,000</u>				

- (b) Assignment of each activity's overhead cost to products using ABC:

Activity Cost Pools	Scissors Jacks			Hydraulic Jacks		
	Expected Use of Cost Drivers per Product	Activity-Based Overhead Rates	= Assigned	Expected Use of Cost Drivers per Product	Activity-Based Overhead Rates	= Assigned
Ordering and receiving	1,000	\$80	\$ 80,000	1,500	\$80	\$ 120,000
Machine setup	500	\$500	250,000	700	\$500	350,000
Machining	300,000	\$2.50	750,000	500,000	\$2.50	1,250,000
Assembling	1,800,000	\$0.60	1,080,000	1,200,000	\$0.60	720,000
Inspecting and testing	20,000	\$20	400,000	15,000	\$20	300,000
Painting	1,800,000	\$0.10	180,000	1,200,000	\$0.10	120,000
Supervising	130,000	\$6	780,000	70,000	\$6	420,000
Total assigned costs			<u>\$3,520,000</u>			<u>\$3,280,000</u>

- (c) Computation of overhead cost per unit:

	<b>Scissors Jack</b>	<b>Hydraulic Jack</b>
Total costs assigned	\$3,520,000	\$3,280,000
Total units produced	200,000	80,000
Overhead cost per unit	<u><u>\$17.60</u></u>	<u><u>\$41.00</u></u>

- (d) These data show that the total overhead assigned to 80,000 hydraulic jacks is nearly as great as the overhead assigned to 200,000 scissors jacks. The overhead cost per hydraulic jack is \$41, but it is only \$17.60 per scissors jack.

Related exercise material: **BE4-5, BE4-6, BE4-7, E4-1, E4-2, E4-3, E4-4, E4-5, E4-6, E4-11, and **Do it! 4-2.****

### Action Plan

- Determine the activity-based overhead rate by dividing the estimated overhead per activity by the expected use of cost drivers per activity.
- Assign the overhead of each activity cost pool to the individual products by multiplying the expected use of cost driver per product times the activity-based overhead rate.
- Determine overhead cost per unit by dividing the overhead assigned to each product by the number of units of that product.



## Activity-Based Costing: A Closer Look

As the use of activity-based costing has grown, both its practical benefits and its limitations have become apparent.

### BENEFITS OF ABC

The primary benefit of ABC is **more accurate product costing**. Here's why:

- ABC leads to more cost pools** being used to assign overhead costs to products. Instead of one plantwide pool (or even departmental pools) and a single cost driver, companies use numerous activity cost pools with more relevant cost drivers. Costs are assigned more directly on the basis of the cost drivers used to produce each product.
- ABC leads to enhanced control over overhead costs.** Under ABC, companies can trace many overhead costs directly to activities—allowing some indirect costs to be identified as direct costs. Thus, managers have become more aware of their responsibility to control the activities that generate those costs.
- ABC leads to better management decisions.** More accurate product costing should contribute to setting selling prices that can help achieve desired product profitability levels. In addition, more accurate cost data could be helpful in deciding whether to make or buy a product part or component, and sometimes even whether to eliminate a product.

Activity-based costing does not change the amount of overhead costs. What it does do is allocate those overhead costs in a more accurate manner. Furthermore, if the scorekeeping is more realistic and more accurate, managers should be able to better understand cost behavior and overall profitability.

### LIMITATIONS OF ABC

Although ABC systems often provide better product cost data than traditional volume-based systems, there are limitations:

- ABC can be expensive to use.** The increased cost of identifying multiple activities and applying numerous cost drivers discourages many companies

### study objective **5**

Understand the benefits and limitations of activity-based costing.

from using ABC. Activity-based costing systems are more complex than traditional costing systems—sometimes significantly more complex. So companies must ask, is the cost of implementation greater than the benefits of greater accuracy? Sometimes it may be. For some companies there may be no need to consider ABC at all because their existing system is sufficient. If the costs of ABC outweigh the benefits, then the company should not implement ABC.

2. **Some arbitrary allocations continue.** Even though more overhead costs can be assigned directly to products through ABC's multiple activity cost pools, certain overhead costs remain to be allocated by means of some arbitrary volume-based cost driver such as labor or machine hours.



## Service Company Insight

### Using ABC to Aid in Employee Evaluation

Although most publicized ABC applications are in manufacturing companies or large service firms, very small service businesses can apply it also. **Mahany Welding Supply**, a small family-run welding service business in Rochester, New York, used ABC to determine the cost of servicing customers and to identify feasible cost-reduction opportunities.

Application of ABC at Mahany Welding's operations provided information about the five employees who were involved in different activities of revenue generation—i.e., delivery of supplies (rural versus city), welding services, repairs, telephone sales, field or door-to-door sales, repeat business sales, and cold-call sales. Managers applied activity cost pools to the five revenue-producing employees using relevant cost drivers. ABC revealed annual net income (loss) by employee as follows:

Employee #1	\$65,431	Employee #4	\$(10,957)
Employee #2	\$35,154	Employee #5	\$(46,180)
Employee #3	\$13,731		

This comparative information was an eye-opener to the owner of Mahany Welding—who was Employee #5!

Source: Michael Krupnicki and Thomas Tyson, "Using ABC to Determine the Cost of Servicing Customers," *Management Accounting* (December 31, 1997), pp. 40–46.



What positive implications does application of ABC have for the employees of this company?

## WHEN TO USE ABC

How does a company know when to use ABC? The presence of one or more of the following factors would point to its possible use:

1. Product lines differ greatly in volume and manufacturing complexity.
2. Product lines are numerous and diverse, and they require differing degrees of support services.
3. Overhead costs constitute a significant portion of total costs.
4. The manufacturing process or the number of products has changed significantly—for example, from labor-intensive to capital-intensive due to automation.
5. Production or marketing managers are ignoring data provided by the existing system and are instead using “bootleg” costing data or other alternative data when pricing or making other product decisions.

The redesign and installation of a product costing system is a significant decision that requires considerable cost and a major effort to accomplish. Therefore, financial managers need to be very cautious and deliberate when initiating changes in costing systems. A key factor in implementing a successful ABC system is the support of top management.



## DECISION TOOLKIT

DECISION CHECKPOINTS	INFO NEEDED FOR DECISION	TOOL TO USE FOR DECISION	HOW TO EVALUATE RESULTS
When should we use ABC?	Knowledge of the products or product lines, the manufacturing process, and overhead costs	A detailed and accurate cost accounting system; cooperation between accountants and operating managers	Compare the results under both costing systems. If managers are better able to understand and control their operations using ABC, and the costs are not prohibitive, use of ABC would be beneficial.

### VALUE-ADDED VERSUS NON-VALUE-ADDED ACTIVITIES

Some companies that have experienced the benefits of activity-based costing have applied it to a broader range of management activities. **Activity-based management (ABM)** extends the use of ABC from product costing to a comprehensive management tool that focuses on reducing costs and improving processes and decision making. A refinement of activity-based costing used in ABM is the classification of activities as either value-added or non-value-added.

**Value-added activities increase the worth of a product or service** to customers. Such activities involve resource usage and related costs that customers are willing to pay for. Value-added activities are the activities of actually manufacturing a product or performing a service. Examples of value-added activities in a manufacturing operation are engineering design, machining, assembly, painting, and packaging. Examples of value-added activities in a service company would be performing surgery, providing legal research for legal services, or delivering packages by a delivery service.

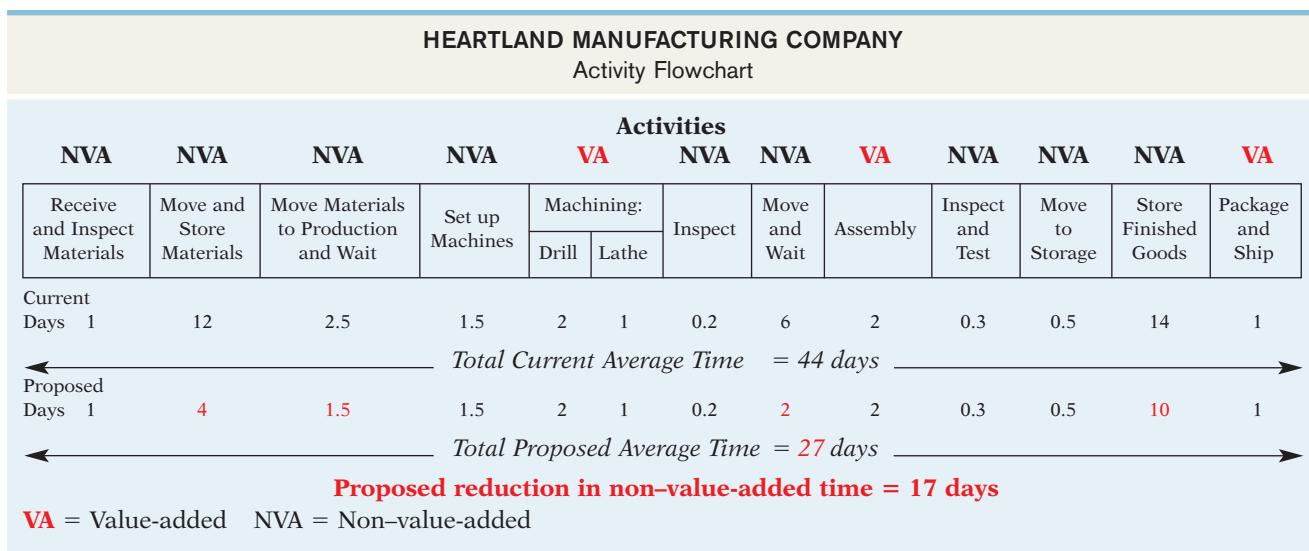
**Non-value-added activities** are production- or service-related activities that simply **add cost to or increase the time spent on a product or service without increasing its market value**. Examples of non-value-added activities in a manufacturing operation include the repair of machines; the storage of inventory; the moving of raw materials, assemblies, and finished product within the factory; building maintenance; inspections; and inventory control. Examples of non-value-added activities in service enterprises might include taking appointments, reception, bookkeeping, billing, traveling, ordering supplies, advertising, cleaning, and computer repair.

Companies often use **activity flowcharts** to help identify the ABC activities. Illustration 4-12 (page 164) shows an activity flowchart. The top part of this flowchart identifies activities as value-added or non-value-added. The value-added activities are highlighted in red. Two rows in the lower part of the flowchart show the number of days spent on each activity. The first row shows the number of days spent on each activity under the current manufacturing process. The second row shows the number of days expected to be spent on each activity under management's proposed reengineered manufacturing process.

The proposed changes would reduce time spent on non-value-added activities by 17 days. This 17-day improvement would be due entirely to moving

#### study objective 6

Differentiate between value-added and non-value-added activities.

**Illustration 4-12**

Flowchart showing value-added and non-value-added activities

inventory more quickly through the non-value-added processes—that is, by reducing inventory time in moving, storage, and waiting. The appendix at the end of this chapter discusses a just-in-time inventory system, which some companies use to eliminate non-value-added activities related to inventory.

Not all activities labeled non-value-added are totally wasteful, nor can they be totally eliminated. For example, although inspection time is a non-value-added activity from a customer's perspective, few companies would eliminate their quality control functions. Similarly, moving and waiting time is non-value-added, but it would be impossible to completely eliminate. Nevertheless, when managers recognize the non-value-added characteristic of these activities, they are motivated to minimize them as much as possible. Attention to such matters is part of the growing practice of activity-based management, which helps managers concentrate on **continuous improvement** of operations and activities.

*before you go on...*
**Value-Added Activities****Do it!**

Classify each of the following activities within a dental practice as value-added (VA) or non-value-added (NVA).



1. Ordering supplies.
2. Taking appointments.
3. Completing continuing education requirements.
4. Explaining dental-hygiene techniques to patients.
5. Completing insurance documents.
6. Examining patients.

**Solution**

1. NVA.
2. NVA.
3. VA.
4. VA.
5. NVA.
6. VA.

Related exercise material: **BE4-8, BE4-9, E4-13, E4-14, E4-15, E4-16**, and **Do it! 4-3**.

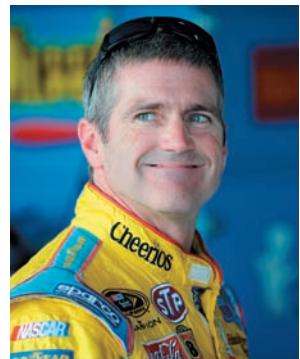




## Management Insight

### What Does NASCAR Have to Do with Breakfast Cereal?

Often the best way to improve a process is to learn from observing a different process. Production-line technicians from giant food producer **General Mills** were flown to North Carolina to observe first-hand how race-car pit crews operate. In a NASCAR race, the value-added activity is driving toward the finish line; any time spent in the pit is non-value-added. Every split second saved in the pit increases the chances of winning. From what the General Mills technicians learned at the car race, as well as other efforts, they were able to reduce setup time from 5 hours to just 20 minutes.



What are the benefits of reducing setup time?



## DECISION TOOLKIT

DECISION CHECKPOINTS	INFO NEEDED FOR DECISION	TOOL TO USE FOR DECISION	HOW TO EVALUATE RESULTS
How can activity-based management help managers manage the business?	Activities classified as value-added and non-value-added	Activity flowchart	The flowchart should motivate managers to minimize non-value-added activities. Managers should better understand the relationship between activities and the resources they consume.

## CLASSIFICATION OF ACTIVITY LEVELS

As mentioned earlier, traditional costing systems are volume-driven—driven by unit-based cost drivers such as direct labor or machine hours. Some activity costs are strictly variable and are caused by the production or acquisition of a single unit of product or the performance of a single unit of service. However, the recognition that other activity costs are not driven by unit-based cost drivers has led to the development of a classification of ABC activities consisting of four levels, as follows:

1. **Unit-level activities.** Activities performed for each unit of production.
2. **Batch-level activities.** Activities performed for each batch of products rather than each unit.
3. **Product-level activities.** Activities performed in support of an entire product line, but not always performed every time a new unit or batch of products is produced.
4. **Facility-level activities.** Activities required to support or sustain an entire production process.

Companies may achieve greater accuracy in overhead cost allocation by recognizing these four different levels of activities and, from them, developing specific activity cost pools and their related cost drivers. Illustration 4-13 (page 166) graphically displays this four-level activity hierarchy, along with the types of activities and examples of cost drivers for those activities at each level.

This classification provides managers a structured way of thinking about the relationships between activities and the resources they consume. In contrast, traditional volume-based costing recognizes only unit-level costs. **Failure to recognize this classification of activities is one of the reasons that volume-based cost allocation causes distortions in product costing.**

### study objective 7

Understand the value of using activity levels in activity-based costing.

**Illustration 4-13**

Hierarchy of activity levels

Four Levels	Types of Activities	Examples of Cost Drivers
<b>Unit-Level Activities</b>	<u>Machine-related</u> Drilling, cutting, milling, trimming, pressing	Machine hours
	<u>Labor-related</u> Assembling, painting, sanding, sewing	Direct labor hours or cost
<b>Batch-Level Activities</b>	Equipment setups Purchase ordering Inspection  Material handling	Number of setups or setup time Number of purchase orders Number of inspections or inspection time  Number of material moves
<b>Product-Level Activities</b>	Product design Engineering changes	Number of product designs Number of changes
<b>Facility-Level Activities</b>	Plant management salaries Plant depreciation Property taxes Utilities	Number of employees managed Square footage Square footage Square footage

As indicated earlier, allocating all overhead costs by unit-based cost drivers can send false signals to managers: Dividing batch-, product-, or facility-level costs by the number of units produced gives the mistaken impression that these costs vary with the number of units. **The resources consumed by batch-, product-, and facility-level supporting activities do not vary at the unit level**, nor can managers control them at the unit level. The number of activities performed at the batch level goes up as the *number of batches* rises—not as the number of units within the batches changes. Similarly, the number of product-level activities performed depends on the *number of different products*—not on how many units or batches are produced. Furthermore facility-sustaining activity costs are not dependent upon the number of products, batches, or units produced. Companies can control batch-, product-, and facility-level costs only by modifying batch-, product-, and facility-level activities.

**before you go on...****Classify Activity Levels****Do it!**

Morgan Toy Company manufactures six primary product lines in its Morganville plant. As a result of an activity analysis, the accounting department has identified eight activity cost pools. Each of the toy products is produced in large batches, with the whole plant devoted to one product at a time. Classify each of the following activities as either unit-level, batch-level, product-level, or facility-level: (a) engineering design,

(b) machine setup, (c) toy design, (d) plant cafeteria, (e) inspections after each setup, (f) polishing parts, (g) assembling parts, (h) health and safety.

### Solution

(a) product-level. (b) batch-level. (c) product-level. (d) facility-level. (e) batch-level. (f) unit-level. (g) unit-level. (h) facility-level.

Related exercise material: BE4-10, BE4-11, BE4-12, E4-17, E4-18, and **Do it! 4-4**.

### Action Plan

- You should use: **unit-level** activities for each unit of product; **batch-level** activities for each batch of product; **product-level** activities for an entire product line; and **facility-level** activities for across the entire range of products.



## Activity-Based Costing in Service Industries

Although initially developed and implemented by manufacturers, activity-based costing has been widely adopted in service industries as well. ABC has been a useful tool in such diverse industries as airlines, railroads, hotels, hospitals, banks, insurance companies, telephone companies, and financial services firms. The overall objective of ABC in service firms is no different than it is in a manufacturing company. That objective is to identify the key activities that generate costs and to keep track of how many of those activities are performed for each service provided (by job, service, contract, or customer).

The general approach to identifying activities, activity cost pools, and cost drivers is the same for service companies and for manufacturers. Also, the labeling of activities as value-added and non-value-added, and the attempt to reduce or eliminate non-value-added activities as much as possible, is just as valid in service industries as in manufacturing operations. What sometimes makes implementation of activity-based costing difficult in service industries is that **a larger proportion of overhead costs are company-wide costs** that cannot be directly traced to specific services provided by the company.

To illustrate the application of activity-based costing to a service enterprise, contrasted to traditional costing, we use a public accounting firm. This illustration is equally applicable to a law firm, consulting firm, architect, or any service firm that performs numerous services for a client as part of a job.

### TRADITIONAL COSTING EXAMPLE

Assume that the public accounting firm of Check and Doublecheck prepares the condensed annual budget shown in Illustration 4-14.

### study objective 8

Apply activity-based costing to service industries.



#### CHECK AND DOUBLECHECK, CPAs Annual Budget

Revenue		\$ 2,000,000
Direct labor	\$ 600,000	
Overhead (expected)	<u>1,200,000</u>	
Total costs		1,800,000
Operating income		<u>\$ 200,000</u>

$$\frac{\text{Estimated overhead}}{\text{Direct labor cost}} = \text{Predetermined overhead rate}$$

$$\frac{\$1,200,000}{\$600,000} = 200\%$$

### Illustration 4-14

Condensed annual budget of a service firm under traditional costing

Under *traditional costing*, direct labor is the professional service performed, and it is the basis for overhead application to each audit job. To determine the operating income earned on any job, Check and Doublecheck applies overhead at the rate of 200% of actual direct professional labor costs incurred. For example, assume that Check and Doublecheck records \$70,000 of actual direct professional labor cost during its audit of Plano Molding Company, which was billed an audit fee of \$260,000. Under traditional costing, using 200% as the rate for applying overhead to the job, Check and Doublecheck would compute applied overhead and operating income related to the Plano Molding Company audit, as shown in Illustration 4-15.

**Illustration 4-15**

Overhead applied under traditional costing system

CHECK AND DOUBLECHECK, CPAs Plano Molding Company Audit		
Revenue		\$260,000
Less: Direct professional labor	\$ 70,000	
Applied overhead (200% × \$70,000)	<u>140,000</u>	210,000
Operating income		<u><u>\$ 50,000</u></u>

This example, under traditional costing, uses only one direct cost item and one overhead application rate.

**ACTIVITY-BASED COSTING EXAMPLE**

Under *activity-based costing*, Check and Doublecheck distributes its estimated annual overhead costs of \$1,200,000 to several activity cost pools. The firm computes activity-based overhead rates per cost driver by dividing each activity overhead cost pool by the expected number of cost drivers used per activity. Illustration 4-16 shows an annual overhead budget using an ABC system.

**Illustration 4-16**

Condensed annual budget of a service firm under activity-based costing

CHECK AND DOUBLECHECK, CPAs Annual Overhead Budget				
Activity Cost Pools	Cost Drivers	Estimated Overhead	÷	Expected Use of Cost Drivers per Activity = Activity-Based Overhead Rates
Secretarial support	Direct professional hours	\$210,000	30,000	\$7 per hour
Direct labor fringe benefits	Direct labor cost	240,000	\$600,000	\$0.40 per \$1 labor cost
Printing and photocopying	Working paper pages	20,000	20,000	\$1 per page
Computer support	CPU minutes	200,000	50,000	\$4 per minute
Telephone and postage	None (traced directly)	71,000	N/A	Based on usage
Legal support	Hours used	129,000	860	\$150 per hour
Insurance (professional liability, etc.)	Revenue billed	120,000	\$2,000,000	\$0.06 per \$1 revenue
Recruiting and training	Direct professional hours	<u>210,000</u>	30,000	\$7 per hour
		<u><u>\$1,200,000</u></u>		

Note that some of the overhead costs can be directly assigned (see telephone and postage).

The assignment of the individual overhead activity rates to the actual number of activities used in the performance of the Plano Molding Company audit results in total overhead assigned of \$165,100, as shown in Illustration 4-17.

Check and Doublecheck CPA.xls				
	A	B	C	D
1				
2				
3				
4	<b>Check and Doublecheck, CPAs Plano Molding Company Audit</b>			
	Activity Cost Pools	Cost Drivers	Actual Use of Drivers	Activity-Based Overhead Rates
5	Secretarial support	Direct professional hours	3,800	\$7.00
6	Direct labor fringe benefits	Direct labor cost	\$70,000	\$0.40
7	Printing and photocopying	Working paper pages	1,800	\$1.00
8	Computer support	CPU minutes	8,600	\$4.00
9	Telephone and postage	None (traced directly)		8,700
10	Legal support	Hours used	156	\$150.00
11	Insurance (professional liability, etc)	Revenue billed	\$260,000	\$0.06
12	Recruiting and training	Direct professional hours	3,800	\$7.00
13				\$165,100

**Illustration 4-17**  
Assigning overhead in a service company

Under activity-based costing, Check and Doublecheck assigns overhead costs of \$165,100 to the Plano Molding Company audit, as compared to \$140,000 under traditional costing. Illustration 4-18 compares total costs and operating margins under the two costing systems.

CHECK AND DOUBLECHECK, CPAs Plano Molding Company Audit		
	Traditional Costing	ABC
Revenue	\$260,000	\$260,000
Expenses		
Direct professional labor	\$ 70,000	\$ 70,000
Applied overhead	<u>140,000</u>	<u>165,100</u>
Total expenses	<u>210,000</u>	<u>235,100</u>
Operating income	<u><b>\$ 50,000</b></u>	<u><b>\$ 24,900</b></u>
Profit margin	<b>19.2%</b>	<b>9.6%</b>

**Illustration 4-18**  
Comparison of traditional costing with ABC in a service company

The comparison shows that the assignment of overhead costs under traditional costing is distorted. The total cost assigned to performing the audit of Plano Molding Company is greater under activity-based costing by \$25,100, and

the profit margin is only half as great. Traditional costing gives the false impression of an operating profit of \$50,000. This is more than double the operating income of \$24,900 using ABC.



## Service Company Insight

### Wasted Effort

Many times, good ideas for new businesses result from identifying non-value-added activities in everyday processes. Said differently, figure out how to make somebody else's life easier, and they will be happy to pay you for your trouble. Think about the last time you moved your belongings. The primary essential activity is getting your stuff from point A to point B. What is one non-value-added activity that you probably engaged in? Did you buy boxes and (expensive) packaging tape, assemble and tape boxes, cut open boxes, and then crush and dispose of boxes? Because all of that effort contributed very little toward getting your stuff moved, some creative entrepreneurs have recently started renting reusable plastic bins. They deliver the bins, customers pack them and move them, and then the company comes and picks them up—all for about the same cost as buying a bunch of cardboard boxes, without all the hassle.

Source: Emily B. Hager, "Moving Day Without All the Waste," *The New York Times Online*, January 22, 2009.



Suppose a moving company has historically sold cardboard boxes and tape to its customers. What relevant costs would it consider in deciding whether to provide plastic bins rather than boxes and tape?

Be sure to read

### all about Y&U

#### Where Does the Time Go?

on the next page for information on how topics in this chapter apply to you.

## Where Does the Time Go?

As discussed in the chapter, the principles underlying activity-based costing have evolved into the broader approach known as activity-based management. As you learned in this chapter, one of the common practices of activity-based management is to identify all business activities, classify each activity as either a value-added or a non-value-added activity, and then try to reduce or eliminate the time spent on non-value-added activities.

Consider the implications of applying this same approach to your everyday life, at work and at school. How do you spend your time each day? How much of your day is spent on activities that help you accomplish your objectives, and how much of your day is spent on activities that do not add value?

### Some Facts

- ★ The average worker wastes about 2.1 hours per eight-hour workday. This does not include lunch and scheduled breaks. According to human resources managers, companies assume that employees will waste about one hour per day.
- ★ The top time-wasting activities cited by employees are surfing the Internet, socializing with coworkers, and conducting personal business.
- ★ Older people waste less time at work than younger people. Men and women waste about the same amount of time.
- ★ The average worker earns \$19.13 per hour. If, as stated above, the average worker wastes about 1.1 hours more per day than employers expect, then the total lost salary dollars is about \$759 billion per year.
- ★ A third (33%) of survey respondents said that they waste time at work because they do not have enough work to do. About a quarter (23%) of respondents said they waste time at work because they are not paid enough.

**Source:** Dan Malachowski, "Wasted Time at Work Costing Companies Billions," *SFGate.com* (accessed February 24, 2007).

### About the Numbers

The information provided in the "Some Facts" section suggests that the average American worker spends a significant portion of the day "wasting" time. How well does the average student fare? A recent survey found that only about 11% of full-time students spend more than 25 hours a week preparing for class (which is about the number of hours that instructors say is needed to do well in college). About 44% of the students in the survey said that they spend less than 10 hours per week. The table below provides additional information from that survey.

How Students Spend Time Each Week (in hours)	First-Year Students		Seniors	
	Part-time	Full-time	Part-time	Full-time
Studying	9	13	10	14
Working on-campus	2	3	3	4
Working off-campus	18	5	20	10
Participating in co-curricular activities	1	5	2	5
Relaxing and socializing	10	12	10	11
Caring for dependents	13	2	12	4
Commuting to class	5	4	5	5

**Source:** National Survey of Student Engagement—Annual Report 2004, Center for Postsecondary Research, Indiana University, School of Education, Table 2.

### What Do You Think?

Many "self-help" books and websites offer suggestions on how to improve your time management. Should you minimize the "non-value-added" hours in your life by adopting the methods suggested by these sources?

**YES:** There are a limited number of hours in a day. You should try to maximize your chances of achieving your goals by eliminating the time that you waste.

**NO:** Life is about more than working yourself to death. Being an efficiency expert doesn't guarantee that you will be happy. Schedules and daily planners are too constraining.



## **USING THE DECISION TOOLKIT**

Precor Company manufactures a line of high-end exercise equipment of commercial quality. Assume that the chief accountant has proposed changing from a traditional costing system to an activity-based costing system. The financial vice president is not convinced, so she requests that the next large order for equipment be costed under both systems for purposes of comparison and analysis. An order from Slim-Way Salons, Inc., for 150 low-impact treadmills is received and is identified as the order to be subjected to dual costing. The following cost data relate to the Slim-Way order.

### **Data relevant to both costing systems**

Direct materials	\$55,500
Direct labor hours	820
Direct labor rate per hour	\$ 18.00

### **Data relevant to the traditional costing system**

Predetermined overhead rate is 300% of direct labor cost.

### **Data relevant to the activity-based costing system**

<b>Activity Cost Pools</b>	<b>Cost Drivers</b>	<b>Activity-Based Overhead Rate</b>	<b>Expected Use of Cost Drivers for Treadmill Order</b>
Engineering design	Engineering hours	\$30 per hour	330
Machine setup	Setups	\$200 per setup	22
Machining	Machine hours	\$25 per hour	732
Assembly	Number of subassemblies	\$8 per subassembly	1,500
Packaging and shipping	Packaging/shipping hours	\$15 per hour	152
Building occupancy	Machine hours	\$6 per hour	732

### **Instructions**

Compute the total cost of the Slim-Way Salons, Inc. order under (a) the traditional costing system and (b) the activity-based costing system. (c) As a result of this comparison, which costing system is Precor likely to adopt? Why?

### **Solution**

- (a) Traditional costing system:

Direct materials	\$ 55,500
Direct labor ( $820 \times \$18$ )	14,760
Overhead assigned ( $\$14,760 \times 300\%$ )	44,280
Total costs assigned to Slim-Way order	<u><u>\$114,540</u></u>
Number of low-impact treadmills	150
Cost per unit	<u><u>\$763.60</u></u>

- (b) Activity-based costing system:

Direct materials	\$ 55,500
Direct labor ( $820 \times \$18$ )	14,760
Overhead activities costs:	
Engineering design (330 hours @ \$30)	\$ 9,900
Machine setup (22 setups @ \$200)	4,400
Machining (732 machine hours @ \$25)	18,300
Assembly (1,500 subassemblies @ \$8)	12,000
Packaging and shipping (152 hours @ \$15)	2,280
Building occupancy (732 hours @ \$6)	4,392
Total costs assigned to Slim-Way order	<u><u>\$121,532</u></u>
Number of low-impact treadmills	150
Cost per unit	<u><u>\$810.21</u></u>

- (c) Precor Company will likely adopt ABC because of the difference in the cost per unit (which ABC found to be higher). More importantly, ABC provides greater insight into the sources and causes of the cost per unit. Managers are given greater insight into which activities to control in order to reduce costs. ABC will provide better product costing and greater profitability for the company.



## Summary of Study Objectives

**1 Recognize the difference between traditional costing and activity-based costing.** A traditional costing system allocates overhead to products on the basis of predetermined plantwide or departmentwide rates such as direct labor or machine hours. An ABC system allocates overhead to identified activity cost pools, and then assigns costs to products using related cost drivers that measure the activities (resources) consumed.

**2 Identify the steps in the development of an activity-based costing system.** The development of an activity-based costing system involves four steps: (1) Identify and classify the major activities involved in the manufacture of specific products, and allocate manufacturing overhead costs to the appropriate cost pools. (2) Identify the cost driver that has a strong correlation to the costs accumulated in the cost pool. (3) Compute the overhead rate per cost driver. (4) Assign manufacturing overhead costs for each cost pool to products or services using the overhead rates.

**3 Know how companies identify the activity cost pools used in activity-based costing.** To identify activity cost pools, a company must perform an analysis of each operation or process, documenting and timing every task, action, or transaction.

**4 Know how companies identify and use cost drivers in activity-based costing.** Cost drivers identified for assigning activity cost pools must (a) accurately measure the actual consumption of the activity by the various products and (b) have related data easily available.

**5 Understand the benefits and limitations of activity-based costing.** Features of ABC that make it a more accurate product costing system include: (1) the increased number of cost pools used to assign overhead, (2) the enhanced control over overhead costs, and (3) the

better management decisions it makes possible. The limitations of ABC are: (1) the higher analysis and measurement costs that accompany multiple activity centers and cost drivers, and (2) the necessity still to allocate some costs arbitrarily.

**6 Differentiate between value-added and non-value-added activities.** Value-added activities increase the worth of a product or service. Non-value-added activities simply add cost to or increase the time spent on a product or service without increasing its market value. Awareness of these classifications encourages managers to reduce or eliminate the time spent on non-value-added activities.

**7 Understand the value of using activity levels in activity-based costing.** Activities may be classified as unit-level, batch-level, product-level, and facility-level. Companies control overhead costs at unit-, batch-, product-, and facility-levels by modifying unit-, batch-, product-, and facility-level activities, respectively. Failure to recognize this classification of levels can result in distorted product costing.

**8 Apply activity-based costing to service industries.** The overall objective of using ABC in service industries is no different than for manufacturing industries—that is, improved costing of services provided (by job, service, contract, or customer). The general approach to costing is the same: analyze operations, identify activities, accumulate overhead costs by activity cost pools, and identify and use cost drivers to assign the cost pools to the services.



## DECISION TOOLKIT A SUMMARY

DECISION CHECKPOINTS	INFO NEEDED FOR DECISION	TOOL TO USE FOR DECISION	HOW TO EVALUATE RESULTS
When should we use ABC?	Knowledge of the products or product lines, the manufacturing process, and overhead costs	A detailed and accurate cost accounting system; cooperation between accountants and operating managers	Compare the results under both costing systems. If managers are better able to understand and control their operations using ABC, and the costs are not prohibitive, the use of ABC would be beneficial.

DECISION CHECKPOINTS	INFO NEEDED FOR DECISION	TOOL TO USE FOR DECISION	HOW TO EVALUATE RESULTS
How can activity-based management help managers manage the business?	Activities classified as value-added and non-value-added	Activity flowchart	The flowchart should motivate managers to minimize non-value-added activities. Managers should better understand the relationship between activities and the resources they consume.

## appendix

# Just-in-Time Processing

### study objective 9

Explain just-in-time (JIT) processing.

Traditionally, continuous process manufacturing has been based on a **just-in-case** philosophy: Inventories of raw materials are maintained *just in case* some items are of poor quality or a key supplier is shut down by a strike. Similarly, subassembly parts are manufactured and stored *just in case* they are needed later in the manufacturing process. Finished goods are completed and stored *just in case* unexpected and rush customer orders are received. This philosophy often results in a “**push approach**,” in which raw materials and subassembly parts are pushed through each process. Traditional processing often results in the buildup of extensive manufacturing inventories.

Primarily in response to foreign competition, many U.S. firms have switched to **just-in-time (JIT) processing**. JIT manufacturing is dedicated to having the right amount of materials, parts, or products just as they are needed. JIT first hit the United States in the early 1980s when automobile companies adopted it to compete with foreign automakers. Many companies, including **Dell**, **Caterpillar**, and **Harley-Davidson**, now successfully use JIT. Under JIT processing, companies receive raw materials **just in time** for use in production, they complete subassembly parts **just in time** for use in finished goods, and they complete finished goods **just in time** to be sold. Illustration 4A-1 shows the sequence of activities in just-in-time processing.

### OBJECTIVE OF JIT PROCESSING

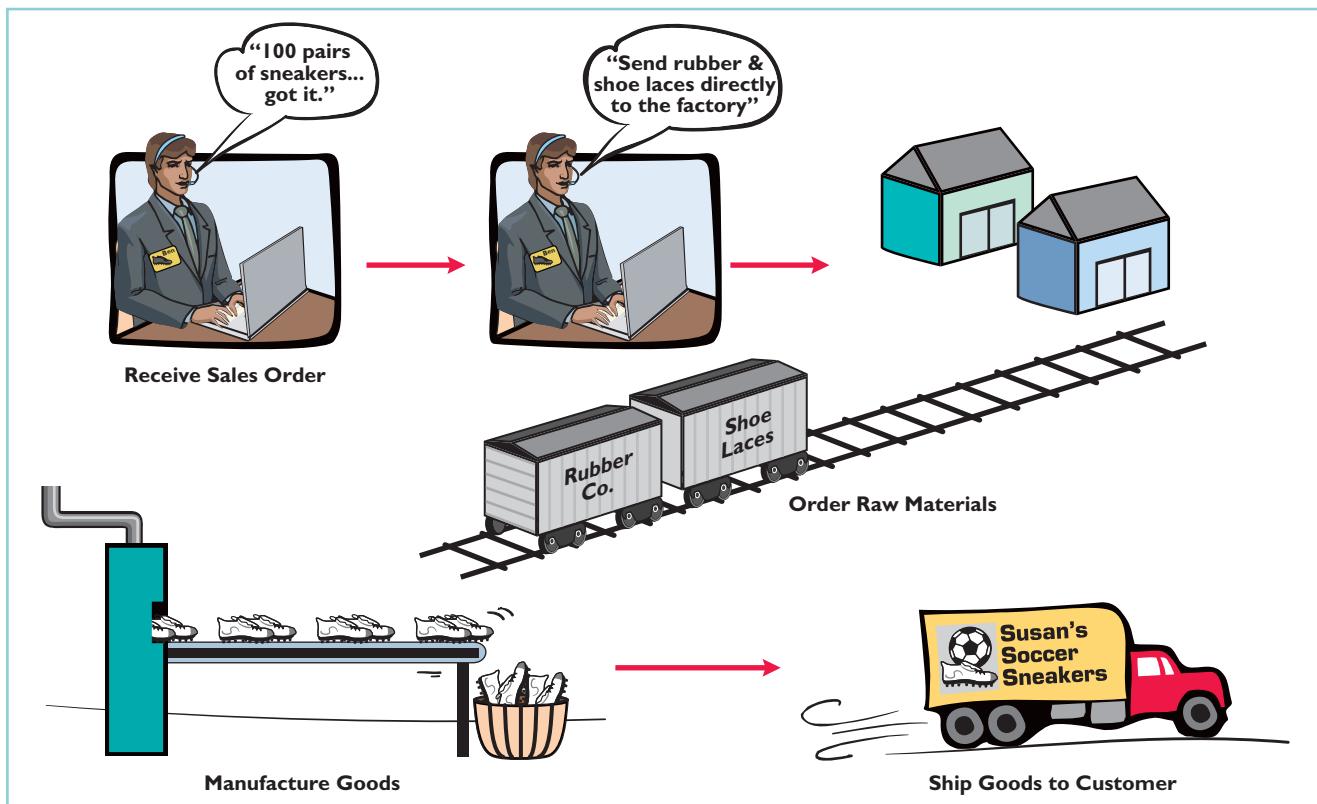
A primary objective of JIT is to eliminate all manufacturing inventories. Inventories have an adverse effect on net income because they tie up funds and storage space that could be put to more productive uses. JIT strives to eliminate inventories by using a “**pull approach**” in manufacturing. This approach begins with the customer placing an order with the company, which starts the process of pulling the product through the manufacturing process. A computer at the final work station sends a signal to the preceding work station. This signal indicates the exact materials (parts and subassemblies) needed to complete the production of a specified product for a specified time period, such as an eight-hour shift. The next-preceding process, in turn, sends its signal to other processes back up the line. The goal is a smooth continuous flow in the manufacturing process, with no buildup of inventories at any point.

### ELEMENTS OF JIT PROCESSING

There are three important elements in JIT processing:

1. **Dependable suppliers.** Suppliers must be willing to deliver on short notice exact quantities of raw materials according to precise quality specifications (even including multiple deliveries within the same day). Suppliers must also

**Helpful Hint** Buyer leverage is important in finding dependable suppliers. Companies like **GM** and **GE** have more success than smaller companies.



**Illustration 4A-1**  
Just-in-time processing

be willing to deliver the raw materials at specified work stations rather than at a central receiving department. This type of purchasing requires constant and direct communication. Such communication is facilitated by an online computer linkage between the company and its suppliers.

2. A **multiskilled work force**. Under JIT, machines are often strategically grouped into work cells or work stations. Much of the work is automated. As a result, one worker may operate and maintain several different types of machines.
3. A **total quality control system**. The company must establish total quality control throughout the manufacturing operations. Total quality control means **no defects**. Since the pull approach signals only required quantities, any defects at any work station will shut down operations at subsequent work stations. Total quality control requires continuous monitoring by both line employees and supervisors at each work station.

**Helpful Hint** Without its emphasis on quality control, JIT would be impractical or even impossible. In JIT, quality is engineered into the production process.

## BENEFITS OF JIT PROCESSING

The major benefits of implementing JIT processing are:

1. Significant reduction or elimination of manufacturing inventories.
2. Enhanced product quality.
3. Reduction or elimination of rework costs and inventory storage costs.
4. Production cost savings from the improved flow of goods through the processes.

The effects in many cases have been dramatic. For example, after using JIT for two years, a major division of **Hewlett-Packard** found that work in process inventories (in dollars) were down 82%, scrap/rework costs were down 30%, space utilization improved by 40%, and labor efficiency improved 50%. As indicated, JIT not only reduces inventory but also enables a manufacturer to produce a better product faster and with less waste.

One of the major accounting benefits of JIT is the elimination of separate raw materials and work in process inventory accounts. These accounts are replaced by **one account**, Raw and In-Process Inventory. All materials and conversion costs are charged to this account. The reduction (or elimination) of in-process inventories results in a simpler computation of equivalent units of production.

## Summary of Study Objective for Appendix

- 9 Explain just-in-time (JIT) processing.** JIT is a processing system dedicated to having on hand the right materials and products just at the time they are needed, thereby reducing the amount of inventory and the time inventory is held. One of the principal account-

ing effects is that one account, Raw and In-Process Inventory, replaces both the raw materials and work-in-process inventory accounts.



## Glossary

**Activity** (p. 153) Any event, action, transaction, or work sequence that incurs cost when producing a product or providing a service.

**Activity-based costing (ABC)** (p. 153) An overhead cost-allocation system that allocates overhead to multiple activity cost pools and assigns the activity cost pools to products or services by means of cost drivers that represent the activities used.

**Activity-based management (ABM)** (p. 163) Extends ABC from product costing to a comprehensive management tool that focuses on reducing costs and improving processes and decision making.

**Activity cost pool** (p. 153) The overhead cost attributed to a distinct type of activity or related activities.

**Batch-level activities** (p. 165) Activities performed for each batch of products rather than for each unit.

**Cost driver** (p. 153) Any factor or activity that has a direct cause-effect relationship with the resources consumed. In ABC, cost drivers are used to assign activity cost pools to products or services.

**Facility-level activities** (p. 165) Activities required to support or sustain an entire production process.

**\*Just-in-time (JIT) processing** (p. 174) A processing system dedicated to having the right amount of materials, parts, or products arrive as they are needed, thereby reducing the amount of inventory.

**Non-value-added activity** (p. 163) An activity that adds cost to or increases the time spent on a product or service without increasing its market value.

**Product-level activities** (p. 165) Activities performed in support of an entire product line, but not always performed every time a new unit or batch of products is produced.

**Unit-level activities** (p. 165) Activities performed for each unit of production.

**Value-added activity** (p. 163) An activity that increases the worth of a product or service.



## Comprehensive **Do it!**



Spreadwell Paint Company manufactures two high-quality base paints: an *oil-based* paint and a *latex* paint. Both are housepaints and are manufactured in neutral white color only. Spreadwell sells the white base paints to franchised retail paint and decorating stores where pigments are added to tint (color) the paint as the customer desires. The oil-based paint is made from, thinned, and cleaned with organic solvents (petroleum products) such as mineral spirits or turpentine. The latex paint is made from, thinned, and cleaned with water; synthetic resin particles are suspended in the water and dry and harden when exposed to the air.

Spreadwell uses the same processing equipment to produce both paints in different production runs. Between batches, the vats and other processing equipment must be washed and cleaned.

After analyzing the company's entire operations, Spreadwell's accountants and production managers have identified activity cost pools and accumulated annual budgeted overhead costs by pool as follows.

<b>Activity Cost Pools</b>	<b>Estimated Overhead</b>
Purchasing	\$ 240,000
Processing (weighing and mixing, grinding, thinning and drying, straining)	1,400,000
Packaging (quarts, gallons, and 5-gallons)	580,000
Testing	240,000
Storage and inventory control	180,000
Washing and cleaning equipment	560,000
Total annual budgeted overhead	<u>\$3,200,000</u>

Following further analysis, activity cost drivers were identified and their expected use by product and activity were scheduled as follows.

<b>Activity Cost Pools</b>	<b>Cost Drivers</b>	<b>Expected Cost Drivers per Activity</b>	<b>Expected Use of Drivers per Product</b>	
			<b>Oil-Based</b>	<b>Latex</b>
Purchasing	Purchase orders	1,500 orders	800	700
Processing	Gallons processed	1,000,000 gals.	400,000	600,000
Packaging	Containers filled	400,000 containers	180,000	220,000
Testing	Number of tests	4,000 tests	2,100	1,900
Storing	Avg. gals. on hand	18,000 gals.	10,400	7,600
Washing	Number of batches	800 batches	350	450

Spreadwell has budgeted 400,000 gallons of oil-based paint and 600,000 gallons of latex paint for processing during the year.

### Instructions

- Prepare a schedule showing the computations of the activity-based overhead rates.
- Prepare a schedule assigning each activity's overhead cost pool to each product.
- Compute the overhead cost per unit for each product.
- Classify each activity cost pool as value-added or non-value-added.

### Solution to Comprehensive **Do it!**

- (a) Computations of activity-based overhead rates:

<b>Activity Cost Pools</b>	<b>Estimated Overhead</b>	$\div$	<b>Expected Use of Cost Drivers</b>	$=$	<b>Activity-Based Overhead Rates</b>
Purchasing	\$ 240,000		1,500 orders		\$160 per order
Processing	1,400,000		1,000,000 gallons		\$1.40 per gallon
Packaging	580,000		400,000 containers		\$1.45 per container
Testing	240,000		4,000 tests		\$60 per test
Storing	180,000		18,000 gallons		\$10 per gallon
Washing	560,000		800 batches		\$700 per batch
	<u>\$3,200,000</u>				

- (b) Assignment of activity cost pools to products:

<b>Activity Cost Pools</b>	<b>Oil-Based Paint</b>			<b>Latex Paint</b>		
	<b>Expected Use of Drivers</b>	<b>Overhead Rates</b>	<b>Cost Assigned</b>	<b>Expected Use of Drivers</b>	<b>Overhead Rates</b>	<b>Cost Assigned</b>
Purchasing	800	\$160	\$ 128,000	700	\$160	\$ 112,000
Processing	400,000	\$1.40	560,000	600,000	\$1.40	840,000
Packaging	180,000	\$1.45	261,000	220,000	\$1.45	319,000
Testing	2,100	\$60	126,000	1,900	\$60	114,000
Storing	10,400	\$10	104,000	7,600	\$10	76,000
Washing	350	\$700	245,000	450	\$700	315,000
Total overhead assigned			<u>\$1,424,000</u>			<u>\$1,776,000</u>

### Action Plan

- Identify the major activities that pertain to the manufacture of specific products and allocate manufacturing overhead costs to activity cost pools.
- Identify the cost drivers that accurately measure each activity's contribution to the finished product.
- Compute the activity-based overhead rates.
- Assign manufacturing overhead costs for each activity cost pool to products, using the activity-based overhead rates.

(c) Computation of overhead cost assigned per unit:

	<b>Oil-Based Paint</b>	<b>Latex Paint</b>
Total overhead cost assigned	<u><u>\$1,424,000</u></u>	<u><u>\$1,776,000</u></u>
Total gallons produced	<u><u>400,000</u></u>	<u><u>600,000</u></u>
Overhead cost per gallon	<u><u>\$3.56</u></u>	<u><u>\$2.96</u></u>

(d) Value-added activities: processing and packaging.

Non-value-added activities: purchasing, testing, storing, and washing.



Note: All asterisked Questions, Exercises, and Problems relate to material in the appendix to the chapter.

## Self-Study Questions

Answers are at the end of the chapter.



- (SO 1) 1. Activity-based costing (ABC):
- can be used only in a process cost system.
  - focuses on units of production.
  - focuses on activities performed to produce a product.
  - uses only a single basis of allocation.
- (SO 1) 2. Activity-based costing:
- is the initial phase of converting to a just-in-time operating environment.
  - can be used only in a job order costing system.
  - is a two-stage overhead cost allocation system that identifies activity cost pools and cost drivers.
  - uses direct labor as its primary cost driver.
- (SO 1, 4) 3. Any activity that causes resources to be consumed is called a:
- just-in-time activity.
  - facility-level activity.
  - cost driver.
  - non-value-added activity.
- (SO 2) 4. The first step in the development of an activity-based costing system is:
- identify and classify activities and allocate overhead to cost pools.
  - assign overhead costs to products.
  - identify cost drivers.
  - compute overhead rates.
- (SO 4) 5. Which of the following would be the best cost driver for the assembling cost pool?
- Number of product lines.
  - Number of parts.
  - Number of orders.
  - Amount of square footage.
- (SO 4) 6. The overhead rate for Machine Setups is \$100 per setup. Products A and B have 80 and 60 setups, respectively. The overhead assigned to each product is:
- Product A \$8,000, Product B \$8,000.
  - Product A \$8,000, Product B \$6,000.
  - Product A \$6,000, Product B \$6,000.
  - Product A \$6,000, Product B \$8,000.
7. Donna Crawford Co. has identified an activity cost pool to which it has allocated estimated overhead of \$1,920,000. It has determined the expected use of cost drivers for that activity to be 160,000 inspections. Widgets require 40,000 inspections, Gadgets 30,000 inspections, and Targets 90,000 inspections. The overhead assigned to each product is:
- Widgets \$40,000, Gadgets \$30,000, Targets \$90,000.
  - Widgets \$640,000, Gadgets \$640,000, Targets \$640,000.
  - Widgets \$360,000, Gadgets \$480,000, Targets \$1,080,000.
  - Widgets \$480,000, Gadgets \$360,000, Targets \$1,080,000.
8. A frequently cited limitation of activity-based costing is:
- ABC results in more cost pools being used to assign overhead costs to products.
  - Certain overhead costs remain to be allocated by means of some arbitrary volume-based cost driver such as labor or machine hours.
  - ABC leads to poorer management decisions.
  - ABC results in less control over overhead costs.
9. A company should consider using ABC if:
- overhead costs constitute a small portion of total product costs.
  - it has only a few product lines that require similar degrees of support services.
  - direct labor constitutes a significant part of the total product cost and a high correlation exists between direct labor and changes in overhead costs.
  - its product lines differ greatly in volume and manufacturing complexity.
10. An activity that adds costs to the product but does not increase its market value is a:
- value-added activity.
  - cost-benefit activity.
  - cost driver.
  - non-value-added activity.
11. The following activity is value-added:
- Storage of raw materials.
  - Moving parts from machine to machine.
  - Shaping a piece of metal on a lathe.
  - All of the above.

(SO 4)

(SO 5)

(SO 5)

(SO 6)

(SO 6)

- (SO 7) **12.** A relevant facility-level cost driver for heating costs is:
- machine hours.
  - direct material.
  - floor space.
  - direct labor cost.

- (SO 9) **\*13.** Under just-in-time processing:
- raw materials are received just in time for use in production.
  - subassembly parts are completed just in time for use in assembling finished goods.
  - finished goods are completed just in time to be sold.
  - All of the above.

- \*14.** The primary objective of just-in-time processing is to: (SO 9)
- accumulate overhead in activity cost pools.
  - eliminate or reduce all manufacturing inventories.
  - identify relevant activity cost drivers.
  - identify value-added activities.

Go to the book's companion website,  
[www.wiley.com/college/weygandt](http://www.wiley.com/college/weygandt),  
 for Additional Self-Study Questions.



## Questions

- Under what conditions is direct labor a valid basis for allocating overhead?
- What has happened in recent industrial history to reduce the usefulness of direct labor as the primary basis for allocating overhead to products?
- In an automated manufacturing environment, what basis of overhead allocation is frequently more relevant than direct labor hours?
- What is generally true about overhead allocation to high-volume products versus low-volume products under a traditional costing system?
- (a) What are the principal differences between activity-based costing (ABC) and traditional product costing?  
 (b) What assumptions must be met for ABC costing to be useful?
- What is the formula for computing activity-based overhead rates?
- What steps are involved in developing an activity-based costing system?
- Explain the preparation and use of a value-added/non-value-added activity flowchart in an ABC system.
- What is an activity cost pool?
- What is a cost driver?
- What makes a cost driver accurate and appropriate?
- What is the formula for assigning activity cost pools to products?
- What are the benefits of activity-based costing?
- What are the limitations of activity-based costing?
- Under what conditions is ABC generally the superior overhead costing system?
- What refinement has been made to enhance the efficiency and effectiveness of ABC for use in managing costs?
- Of what benefit is classifying activities as value-added and non-value-added?
- In what ways is the application of ABC to service industries the same as its application to manufacturing companies?
- What is the relevance of the classification of levels of activity to ABC?
- \*20.** (a) Describe the philosophy and approach of just-in-time processing.  
 (b) Identify the major elements of JIT processing.

## Brief Exercises

**BE4-1** Sanchez Inc. sells a high-speed retrieval system for mining information. It provides the following information for the year:

	Budgeted	Actual
Overhead cost	\$1,000,000	\$950,000
Machine hours	50,000	45,000
Direct labor hours	100,000	90,000

Overhead is applied on the basis of direct labor hours. (a) Compute the predetermined overhead rate. (b) Determine the amount of overhead applied for the year. (c) Explain how an activity-based costing system might differ in terms of computing a predetermined overhead rate.



*Identify differences between costing systems.*

(SO 1)



*Identify differences between costing systems.*  
(SO 1)

**BE4-2** Bowyer Inc. has conducted an analysis of overhead costs related to one of its product lines using a traditional costing system (volume-based) and an activity-based costing system. Here are its results.

	<u>Traditional Costing</u>	<u>ABC</u>
Sales revenues	\$600,000	\$600,000
Overhead costs:		
Product RX3	\$ 34,000	\$ 50,000
Product Y12	36,000	20,000
	<u>\$ 70,000</u>	<u>\$ 70,000</u>

*Identify cost drivers.*  
(SO 4)

*Identify cost drivers.*  
(SO 4)

*Compute activity-based overhead rates.*  
(SO 4)

*Compute activity-based overhead rates.*  
(SO 4)

Explain how a difference in the overhead costs between the two systems may have occurred.

**BE4-3** Montego Co. identifies the following activities that pertain to manufacturing overhead: materials handling, machine setups, factory machine maintenance, factory supervision, and quality control. For each activity, identify an appropriate cost driver.

**BE4-4** Hindi Company manufactures four products in a single production facility. The company uses activity-based costing. The following activities have been identified through the company's activity analysis: (a) inventory control, (b) machine setups, (c) employee training, (d) quality inspections, (e) material ordering, (f) drilling operations, and (g) building maintenance.

For each activity, name a cost driver that might be used to assign overhead costs to products.

**BE4-5** Castilla Company identifies three activities in its manufacturing process: machine setups, machining, and inspections. Estimated annual overhead cost for each activity is \$180,000, \$325,000, and \$87,500, respectively. The cost driver for each activity and the expected annual usage are: number of setups 2,500, machine hours 25,000, and number of inspections 1,750. Compute the overhead rate for each activity.

**BE4-6** Coats Galore, Inc. uses activity-based costing as the basis for information to set prices for its six lines of seasonal coats. Compute the activity-based overhead rates using the following budgeted data for each of the activity cost pools.

<u>Activity Cost Pools</u>	<u>Estimated Overhead</u>	<u>Expected Use of Cost Drivers per Activity</u>
Designing	\$ 450,000	12,000 designer hours
Sizing and cutting	4,000,000	160,000 machine hours
Stitching and trimming	1,440,000	80,000 labor hours
Wrapping and packing	336,000	32,000 finished units

*Compute activity-based overhead rates.*  
(SO 4)

**BE4-7** Computer Parts, Inc., a manufacturer of computer chips, employs activity-based costing. The budgeted data for each of the activity cost pools is provided below for the year 2011.

<u>Activity Cost Pools</u>	<u>Estimated Overhead</u>	<u>Expected Use of Cost Drivers per Activity</u>
Ordering and receiving	\$ 90,000	15,000 orders
Etching	480,000	60,000 machine hours
Soldering	1,760,000	440,000 labor hours

For 2011, the company had 11,000 orders and used 50,000 machine hours, and labor hours totaled 500,000. What is the total overhead applied?

*Classify activities as value-or non-value-added.*  
(SO 6)

**BE4-8** John Harbeck Novelty Company identified the following activities in its production and support operations. Classify each of these activities as either value-added or non-value-added.

- (a) Purchasing. (e) Cost accounting.
- (b) Receiving. (f) Moving work in process.
- (c) Design engineering. (g) Inspecting and testing.
- (d) Storing inventory. (h) Painting and packing.

**BE4-9** Seabrook and Clauss is an architectural firm that is contemplating the installation of activity-based costing. The following activities are performed daily by staff architects. Classify these activities as value-added or non-value-added: (1) designing and drafting, 3 hours; (2) staff meetings, 1 hour; (3) on-site supervision, 2 hours; (4) lunch, 1 hour; (5) consultation with client on specifications, 1.5 hours; (6) entertaining a prospective client for dinner, 2 hours.

Classify service company activities as value- or non-value-added.

(SO 6, 8)



**BE4-10** Quick Pix is a large digital processing center that serves 130 outlets in grocery stores, service stations, camera and photo shops, and drug stores in 16 nearby towns. Quick Pix operates 24 hours a day, 6 days a week. Classify each of the following activity costs of Quick Pix as either unit-level, batch-level, product-level, or facility-level.

Classify activities according to level.

(SO 7, 8)



- Color printing materials.
- Photocopy paper.
- Depreciation of machinery.
- Setups for enlargements.
- Supervisor's salary.
- Ordering materials.
- Pickup and delivery.
- Commission to dealers.
- Insurance on building.
- Loading developing machines.

**BE4-11** Tool Time, Inc. operates 20 injection molding machines in the production of tool boxes of four different sizes, named the Apprentice, the Handyman, the Journeyman, and the Professional. Classify each of the following costs as unit-level, batch-level, product-level, or facility-level.

Classify activities according to level.

(SO 7)

- First-shift supervisor's salary.
- Powdered raw plastic.
- Dies for casting plastic components.
- Depreciation on injection molding machines.
- Changing dies on machines.
- Moving components to assembly department.
- Engineering design.
- Employee health and medical insurance coverage.

**BE4-12** Trek Cycle Company uses three activity pools to apply overhead to its products. Each activity has a cost driver used to allocate the overhead costs to the product. The activities and related overhead costs are as follows: Product design \$50,000; Machining \$300,000; and Material handling \$100,000. The cost drivers and expected use are as follows.

Compute rates and activity levels.

(SO 4, 7)

Activities	Cost Drivers	Expected Use of Cost Drivers per Activity
Product design	Number of product changes	10
Machining	Machine hours	150,000
Material handling	Number of set ups	100

- Compute the predetermined overhead rate for each activity.
- Classify each of these activities as unit-level, batch-level, product-level, or facility-level.

## Do it! Review



**Do it! 4-1** Indicate whether the following statements are true or false.

- The reasoning behind ABC cost allocation is that products consume activities and activities consume resources.
- Activity-based costing is an approach for allocating direct labor to products.
- In today's increasingly automated environment, direct labor is never an appropriate basis for allocating costs to products.
- A cost driver is any factor or activity that has a direct cause-effect relationship with resources consumed.
- Activity-based costing segregates overhead into various cost pools in an effort to provide more accurate cost information.

Identify characteristics of traditional and ABC costing systems.

(SO 1, 2)

Compute activity-based overhead rates and assign overhead using ABC.

(SO 4)

**Do it! 4-2** Weber Industries has three activity cost pools and two products. It expects to produce 3,000 units of Product BC113 and 1,400 of Product AD908. Having identified its activity cost pools and the cost drivers for each pool, Weber accumulated the following data relative to those activity cost pools and cost drivers.

Annual Overhead Data			Expected Use of Cost Drivers per Product		
Activity Cost Pool	Cost Drivers	Estimated Overhead	Expected Use of Cost Drivers per Activity	Product BC113	Product AD908
Machine setup	Setups	\$ 20,000	40	25	15
Machining	Machine hours	110,000	5,000	1,000	4,000
Packing	Orders	30,000	500	150	350

Using the above data, do the following:

- Prepare a schedule showing the computations of the activity-based overhead rates per cost driver.
- Prepare a schedule assigning each activity's overhead cost to the two products.
- Compute the overhead cost per unit for each product. (Round to nearest cent.)
- Comment on the comparative overhead cost per product.

Classify activities as value-or non-value-added.

(SO 6, 8)



Classify activities according to level.

(SO 7)

**Do it! 4-3** Classify each of the following activities within a tax-preparation business as value-added (VA) or non-value-added (NVA).

- Advertising.
- Completing tax returns.
- Cleaning the office.
- Billing clients.
- Answering client questions.
- Accompanying clients to audit proceedings.

**Do it! 4-4** Good Harvest Company manufactures four lines of garden tools. As a result of an activity analysis, the accounting department has identified eight activity cost pools. Each of the product lines is produced in large batches, with the whole plant devoted to one product at a time. Classify each of the following activities or costs as either unit-level, batch level, product-level, or facility-level.

- |                        |                               |
|------------------------|-------------------------------|
| (a) Machining parts.   | (e) Assembling parts.         |
| (b) Product design.    | (f) Purchasing raw materials. |
| (c) Plant maintenance. | (g) Property taxes.           |
| (d) Machine setup.     | (h) Painting.                 |

## Exercises

Assign overhead using traditional costing and ABC.

(SO 1, 4)



**E4-1** Mathews Inc. has two types of handbags: standard and custom. The controller has decided to use a plantwide overhead rate based on direct labor costs. The president has heard of activity-based costing and wants to see how the results would differ if this system were used. Two activity cost pools were developed: machining and machine setup. Presented below is information related to the company's operations.

	Standard	Custom
Direct labor costs	\$50,000	\$100,000
Machine hours	1,000	1,000
Setup hours	100	400

Total estimated overhead costs are \$300,000. Overhead cost allocated to the machining activity cost pool is \$200,000, and \$100,000 is allocated to the machine setup activity cost pool.

### Instructions

- Compute the overhead rate using the traditional (plantwide) approach.
- Compute the overhead rates using the activity-based costing approach.
- Determine the difference in allocation between the two approaches.

**E4-2** Cascio Inc. has conducted the following analysis related to its product lines, using a traditional costing system (volume-based) and an activity-based costing system. Both the traditional and the activity-based costing systems include direct materials and direct labor costs.

*Explain difference between traditional and activity-based costing.  
(SO 1)*

<b>Products</b>	<b>Sales Revenue</b>	<b>Total Costs</b>	
		<b>Traditional</b>	<b>ABC</b>
Product 540X	\$200,000	\$55,000	\$50,000
Product 137Y	160,000	50,000	35,000
Product 249S	80,000	15,000	35,000

**Instructions**

- For each product line, compute operating income using the traditional costing system.
- For each product line, compute operating income using the activity-based costing system.
- Using the following formula, compute the percentage difference in operating income for each of the product lines of Cascio: [Operating Income (ABC) – Operating Income (traditional cost)] ÷ Operating Income (traditional cost). (Round the percentage to two decimals.)
- Provide a rationale as to why the costs for Product 540X are approximately the same using either the traditional or activity-based costing system.

**E4-3** International Fabrics has budgeted overhead costs of \$900,000. It has allocated overhead on a plantwide basis to its two products (wool and cotton) using direct labor hours which are estimated to be 450,000 for the current year. The company has decided to experiment with activity-based costing and has created two activity cost pools and related activity cost drivers. These two cost pools are: Cutting (cost driver is machine hours) and Design (cost driver is number of setups). Overhead allocated to the Cutting cost pool is \$300,000 and \$600,000 is allocated to the Design cost pool. Additional information related to these pools is as follows.

	<b>Wool</b>	<b>Cotton</b>	<b>Total</b>
Machine hours	100,000	100,000	200,000
Number of setups	1,000	500	1,500

**Instructions**

- Determine the amount of overhead allocated to the wool product line and the cotton product line using activity-based costing.
- What amount of overhead would be allocated to the wool and cotton product lines using the traditional approach, assuming direct labor hours were incurred evenly between the wool and cotton? How does this compare with the amount allocated using ABC in part (a)?

**E4-4** Koppa Inc. manufactures two products: car wheels and truck wheels. To determine the amount of overhead to assign to each product line, the controller, Robert Kruegel, has developed the following information.

*Assign overhead using traditional costing and ABC.  
(SO 1, 4)*

	<b>Car</b>	<b>Truck</b>
Estimated wheels produced	40,000	10,000
Direct labor hours per wheel	1	3

Total estimated overhead costs for the two product lines are \$700,000.

*Assign overhead using traditional costing and ABC.  
(SO 1, 4)*



**Instructions**

- Compute the overhead cost assigned to the car wheels and truck wheels, assuming that direct labor hours is used to allocate overhead costs.
- Kruegel is not satisfied with the traditional method of allocating overhead because he believes that most of the overhead costs relate to the truck wheel product line

because of its complexity. He therefore develops the following three activity cost pools and related cost drivers to better understand these costs.

<b>Activity Cost Pools</b>	<b>Expected Use of Cost Drivers</b>	<b>Estimated Overhead Costs</b>
Setting up machines	1,000 setups	\$180,000
Assembling	70,000 labor hours	280,000
Inspection	1,200 inspections	240,000

Compute the activity-based overhead rates for these three cost pools.

- (c) Compute the cost that is assigned to the car wheels and truck wheels product lines using an activity-based costing system, given the following information.

<b>Expected Use of Cost Drivers per Product</b>		
	<b>Car</b>	<b>Truck</b>
Number of setups	200	800
Direct labor hours	40,000	30,000
Number of inspections	100	1,100

- (d) What do you believe Kruegel should do?

Assign overhead using traditional costing and ABC.  
(SO 1, 4)



**E4-5** Shady Lady sells window coverings to both commercial and residential customers. The following information relates to its budgeted operations for the current year.

	<b>Commercial</b>		<b>Residential</b>
Revenues		\$300,000	\$480,000
Direct material costs	\$ 30,000		\$ 50,000
Direct labor costs	100,000		300,000
Overhead costs	50,000	180,000	150,000
Operating income (loss)		\$120,000	(\$ 20,000)

The controller, Kelly Swenson, is concerned about the residential product line. She cannot understand why this line is not more profitable given that the installations of window coverings are less complex for residential customers. In addition, the residential client base resides in close proximity to the company office, so travel costs are not as expensive on a per client visit for residential customers. As a result, she has decided to take a closer look at the overhead costs assigned to the two product lines to determine whether a more accurate product costing model can be developed. Here are the three activity cost pools and related information she developed:

<b>Activity Cost Pools</b>	<b>Estimated Overhead</b>	<b>Cost Drivers</b>
Scheduling and travel	\$90,000	Hours of travel
Setup time	70,000	Number of setups
Supervision	40,000	Direct labor cost

<b>Expected Use of Cost Drivers per Product</b>		
	<b>Commercial</b>	<b>Residential</b>
Scheduling and travel	1,000	500
Setup time	450	250

#### Instructions

- (a) Compute the activity-based overhead rates for each of the three cost pools, and determine the overhead cost assigned to each product line.
- (b) Compute the operating income for each product line, using the activity-based overhead rates.
- (c) What do you believe Kelly Swenson should do?

**E4-6** Custer Corporation manufactures safes—large mobile safes, and large walk-in stationary bank safes. As part of its annual budgeting process, Custer is analyzing the profitability of its two products. Part of this analysis involves estimating the amount of overhead to be allocated to each product line. The following information relates to overhead.

	<b>Mobile Safes</b>	<b>Walk-in Safes</b>
Units planned for production	200	50
Material moves per product line	300	200
Purchase orders per product line	450	350
Direct labor hours per product line	800	1,700

**Instructions**

- (a) The total estimated manufacturing overhead was \$235,000. Under traditional costing (which assigns overhead on the basis of direct-labor hours), what amount of manufacturing overhead costs are assigned to:
  - (1) One mobile safe?
  - (2) One walk-in safe?
- (b) The total estimated manufacturing overhead of \$235,000 was comprised of \$150,000 for material-handling costs and \$85,000 for purchasing activity costs. Under activity-based costing (ABC):
  - (1) What amount of material handling costs are assigned to:
    - (a) One mobile safe?
    - (b) One walk-in safe?
  - (2) What amount of purchasing activity costs are assigned to:
    - (a) One mobile safe?
    - (b) One walk-in safe?
- (c) Compare the amount of overhead allocated to one mobile safe and to one walk-in safe under the traditional costing approach versus under ABC.

**E4-7** Quik Prints Company is a small printing and copying firm with three high-speed offset printing presses, five copiers (two color and three black and white), one collator, one cutting and folding machine, and one fax machine. To improve its pricing practices, owner-manager James Kieper is installing activity-based accounting. Additionally, James employs five employees: two printers/designers, one receptionist/bookkeeper, one sales person/copy-machine operator, and one janitor/delivery clerk. James can operate any of the machines and, in addition to managing the entire operation, he performs the training, designing, selling, and marketing functions.

Assign overhead using traditional costing and ABC.  
**(SO 1, 4)**

Identify activity cost pools.  
**(SO 3)**



**Instructions**

As Quik Prints' independent accountant who prepares tax forms and quarterly financial statements, you have been asked to identify the activities that would be used to accumulate overhead costs for assignment to jobs and customers. Using your knowledge of a small printing and copying firm (and some imagination), identify at least twelve activity cost pools as the start of an activity-based costing system for Quik Prints Company.

**E4-8** Schrager Corporation manufactures snowmobiles in its Blue Mountain, Wisconsin, plant. The following costs are budgeted for the first quarter's operations.

Identify activity cost pools and cost drivers.  
**(SO 3, 4)**

Machine setup, indirect materials	\$ 4,000
Inspections	16,000
Tests	4,000
Insurance, plant	110,000
Engineering design	140,000
Depreciation, machinery	520,000
Machine setup, indirect labor	20,000
Property taxes	29,000
Oil, heating	19,000
Electricity, plant lighting	21,000
Engineering prototypes	60,000
Depreciation, plant	210,000
Electricity, machinery	36,000
Custodial (machine maintenance) wages	19,000

**Instructions**

Classify the above costs of Schrager Corporation into activity cost pools using the following: engineering, machinery, machine setup, quality control, factory utilities, maintenance. Next, identify a cost driver that may be used to assign each cost pool to each line of snowmobiles.

*Identify activity cost drivers.  
(SO 4)*

**E4-9** Wayne Kaegi's Verde Vineyards in Oakville, California, produces three varieties of wine: Merlot, Viognier, and Pinot Noir. His winemaster, Russel Hansen, has identified the following activities as cost pools for accumulating overhead and assigning it to products.

1. Culling and replanting. Dead or overcrowded vines are culled, and new vines are planted or relocated. (Separate vineyards by variety.)
2. Tying. The posts and wires are reset, and vines are tied to the wires for the dormant season.
3. Trimming. At the end of the harvest the vines are cut and trimmed back in preparation for the next season.
4. Spraying. The vines are sprayed with chemicals for protection against insects and fungi.
5. Harvesting. The grapes are hand-picked, placed in carts, and transported to the crushers.
6. Stemming and crushing. Cartfuls of bunches of grapes of each variety are separately loaded into machines which remove stems and gently crush the grapes.
7. Pressing and filtering. The crushed grapes are transferred to presses which mechanically remove the juices and filter out bulk and impurities.
8. Fermentation. The grape juice, by variety, is fermented in either stainless-steel tanks or oak barrels.
9. Aging. The wines are aged in either stainless-steel tanks or oak barrels for one to three years depending on variety.
10. Bottling and corking. Bottles are machine-filled and corked.
11. Labeling and boxing. Each bottle is labeled, as is each nine-bottle case, with the name of the vintner, vintage, and variety.
12. Storing. Packaged and boxed bottles are stored awaiting shipment.
13. Shipping. The wine is shipped to distributors and private retailers.
14. Heating and air-conditioning of plant and offices.
15. Maintenance of buildings and equipment. Printing, repairs, replacements, and general maintenance are performed in the off-season.

**Instructions**

For each of Verde's fifteen activity cost pools, identify a probable cost driver that might be used to assign overhead costs to its three wine varieties.

*Identify activity cost drivers.  
(SO 4)*

**E4-10** Mallory Luongo, Inc. manufactures five models of kitchen appliances at its Mesa plant. The company is installing activity-based costing and has identified the following activities performed at its Mesa plant.

1. Designing new models.
2. Purchasing raw materials and parts.
3. Storing and managing inventory.
4. Receiving and inspecting raw materials and parts.
5. Interviewing and hiring new personnel.
6. Machine forming sheet steel into appliance parts.
7. Manually assembling parts into appliances.
8. Training all employees of the company.
9. Insuring all tangible fixed assets.
10. Supervising production.
11. Maintaining and repairing machinery and equipment.
12. Painting and packaging finished appliances.

Having analyzed its Mesa plant operations for purposes of installing activity-based costing, Mallory Luongo, Inc. identified its activity cost centers. It now needs to identify relevant activity cost drivers in order to assign overhead costs to its products.

**Instructions**

Using the activities listed above, identify for each activity one or more cost drivers that might be used to assign overhead to Mallory Luongo's five products.

**E4-11** Sorce Instrument, Inc. manufactures two products: missile range instruments and space pressure gauges. During April, 50 range instruments and 300 pressure gauges were produced, and overhead costs of \$89,500 were estimated. An analysis of estimated overhead costs reveals the following activities.

Compute overhead rates and assign overhead using ABC.  
(SO 4, 5)



Activities	Cost Drivers	Total Cost
1. Materials handling	Number of requisitions	\$35,000
2. Machine setups	Number of setups	27,500
3. Quality inspections	Number of inspections	27,000
		<u>\$89,500</u>

The cost driver volume for each product was as follows.

Cost Drivers	Instruments	Gauges	Total
Number of requisitions	400	600	1,000
Number of setups	200	300	500
Number of inspections	200	400	600

#### Instructions

- (a) Determine the overhead rate for each activity.
- (b) Assign the manufacturing overhead costs for April to the two products using activity-based costing.
- (c) Write a memorandum to the president of Sorce Instrument explaining the benefits of activity-based costing.

**E4-12** Cassel Clothing Company manufactures its own designed and labeled sports attire and sells its products through catalog sales and retail outlets. While Cassel has for years used activity-based costing in its manufacturing activities, it has always used traditional costing in assigning its selling costs to its product lines. Selling costs have traditionally been assigned to Cassel's product lines at a rate of 70% of direct material costs. Its direct material costs for the month of March for Cassel's "high intensity" line of attire are \$400,000. The company has decided to extend activity-based costing to its selling costs. Data relating to the "high intensity" line of products for the month of March are as follows.

Assign overhead using traditional costing and ABC; classify activities as value-or non-value-added.  
(SO 1, 4, 6)

Activity Cost Pools	Cost Drivers	Overhead Rate	Number of Cost Drivers Used per Activity
Sales commissions	Dollar sales	\$0.05 per dollar sales	\$930,000
Advertising—TV/Radio	Minutes	\$300 per minute	250
Advertising—Newspaper	Column inches	\$10 per column inch	2,000
Catalogs	Catalogs mailed	\$2.50 per catalog	60,000
Cost of catalog sales	Catalog orders	\$1 per catalog order	9,000
Credit and collection	Dollar sales	\$0.03 per dollar sales	\$930,000

#### Instructions

- (a) Compute the selling costs to be assigned to the "high-intensity" line of attire for the month of March: (1) using the traditional product costing system (direct material cost is the cost driver), and (2) using activity-based costing.
- (b) By what amount does the traditional product costing system undercost or overcost the "high-intensity" product line?
- (c) Classify each of the activities as value-added or non-value-added.

**E4-13** Healthy Products, Inc., uses a traditional product costing system to assign overhead costs uniformly to all products. To meet Food and Drug Administration requirements and to assure its customers of safe, sanitary, and nutritious food, Healthy engages in a high level of quality control. Healthy assigns its quality-control overhead costs to all products at a rate of 17% of direct labor costs. Its direct labor cost for the month of June

Assign overhead using traditional costing and ABC; classify activities as value-or non-value-added.  
(SO 1, 4, 6)

for its low-calorie dessert line is \$55,000. In response to repeated requests from its financial vice president, Healthy's management agrees to adopt activity-based costing. Data relating to the low-calorie dessert line for the month of June are as follows.

Activity Cost Pools	Cost Drivers	Overhead Rate	Number of Cost Drivers Used per Activity
Inspections of material received	Number of pounds	\$0.60 per pound	6,000 pounds
In-process inspections	Number of servings	\$0.33 per serving	10,000 servings
FDA certification	Customer orders	\$12.00 per order	420 orders

#### Instructions

- Compute the quality-control overhead cost to be assigned to the low-calorie dessert product line for the month of June: (1) using the traditional product costing system (direct labor cost is the cost driver), and (2) using activity-based costing.
- By what amount does the traditional product costing system undercost or overcost the low-calorie dessert line?
- Classify each of the activities as value-added or non-value-added.

**E4-14** In an effort to expand the usefulness of its activity-based costing system, Wayne Kaegi's Verde Vineyards decides to adopt activity-based management techniques. One of these ABM techniques is classifying its activities as either value-added or non-value-added.

#### Instructions

Using Verde's list of fifteen activity cost pools in Exercise 4-9, classify each of the activities as either value-added or non-value-added.

**E4-15** Mallory Luongo, Inc. is interested in using its activity-based costing system to improve its operating efficiency and its profit margins by applying activity-based management techniques. As part of this undertaking, you have been asked to classify its Mesa plant activities as value-added or non-value-added.

#### Instructions

Using the list of activities identified in Exercise 4-10, classify each activity as either value-added or non-value-added.

**E4-16** Tharp and Kostivas is a law firm that is initiating an activity-based costing system. Ben Tharp, the senior partner and strong supporter of ABC, has prepared the following list of activities performed by a typical attorney in a day at the firm.

Classify activities as value-added or non-value-added.  
(SO 6)

Classify activities as value-added or non-value-added.  
(SO 6)

Classify service company activities as value-added or non-value-added.  
(SO 6, 8)



Activities	Hours
Writing contracts and letters	1.0
Attending staff meetings	0.5
Taking depositions	1.0
Doing research	1.0
Traveling to/from court	1.0
Contemplating legal strategy	1.0
Eating lunch	1.0
Litigating a case in court	2.5
Entertaining a prospective client	2.0

#### Instructions

Classify each of the activities listed by Ben Tharp as value-added or non-value-added and defend your classification. How much was value-added time and how much was non-value-added?

Classify activities by level.  
(SO 7)

**E4-17** Having itemized its costs for the first quarter of next year's budget, Schrager Corporation desires to install an activity-based costing system. First, it identified the activity cost pools in which to accumulate factory overhead; second, it identified the relevant cost drivers. (This was done in Exercise 4-8.)

**Instructions**

Using the activity cost pools identified in Exercise 4-8, classify each of those cost pools as either unit-level, batch-level, product-level, or facility-level.

**E4-18** Richard Harbin & Sons, Inc. is a small manufacturing company in La Jolla that uses activity-based costing. Harbin & Sons accumulates overhead in the following activity cost pools.

Classify activities by level.  
(SO 7)

1. Hiring personnel.
2. Managing parts inventory.
3. Purchasing.
4. Testing prototypes.
5. Designing products.
6. Setting up equipment.
7. Training employees.
8. Inspecting machined parts.
9. Machining.
10. Assembling.

**Instructions**

For each activity cost pool, indicate whether the activity cost pool would be unit-level, batch-level, product-level, or facility-level.

**Exercises: Set B**

Visit the book's companion website at [www.wiley.com/college/weygandt](http://www.wiley.com/college/weygandt), and choose the Student Companion site, to access Exercise Set B.

**Problems: Set A**

**P4-1A** FireOut, Inc. manufactures steel cylinders and nozzles for two models of fire extinguishers: (1) a home fire extinguisher and (2) a commercial fire extinguisher. The *home model* is a high-volume (54,000 units), half-gallon cylinder that holds 2 1/2 pounds of multipurpose dry chemical at 480 PSI. The *commercial model* is a low-volume (10,200 units), two-gallon cylinder that holds 10 pounds of multi-purpose dry chemical at 390 PSI. Both products require 1.5 hours of direct labor for completion. Therefore, total annual direct labor hours are 96,300 or [1.5 hrs.  $\times$  (54,000 + 10,200)]. Expected annual manufacturing overhead is \$1,502,280. Thus, the predetermined overhead rate is \$15.60 or (\$1,502,280  $\div$  96,300) per direct labor hour. The direct materials cost per unit is \$18.50 for the home model and \$26.50 for the commercial model. The direct labor cost is \$19 per unit for both the home and the commercial models.

Assign overhead using traditional costing and ABC; compute unit costs; classify activities as value- or non-value-added.

(SO 1, 4, 6)



The company's managers identified six activity cost pools and related cost drivers and accumulated overhead by cost pool as follows.

Activity Cost Pools	Cost Drivers	Estimated Overhead	Expected Use of Cost Drivers	Expected Use of Drivers by Product	
				Home	Commercial
Receiving	Pounds	\$ 70,350	335,000	215,000	120,000
Forming	Machine hours	150,500	35,000	27,000	8,000
Assembling	Number of parts	390,600	217,000	165,000	52,000
Testing	Number of tests	51,000	25,500	15,500	10,000
Painting	Gallons	52,580	5,258	3,680	1,578
Packing and shipping	Pounds	787,250	335,000	215,000	120,000
				\$1,502,280	

(a) Unit cost—H.M. \$60.90

(c) Cost assigned—H.M. \$1,031,300

(d) Cost/unit—H.M. \$56.60

Assign overhead to products using ABC and evaluate decision.

(SO 4)

**Instructions**

- Under traditional product costing, compute the total unit cost of each product. Prepare a simple comparative schedule of the individual costs by product (similar to Illustration 4-10 on page 158).
- Under ABC, prepare a schedule showing the computations of the activity-based overhead rates (per cost driver).
- Prepare a schedule assigning each activity's overhead cost pool to each product based on the use of cost drivers. (Include a computation of overhead cost per unit, rounding to the nearest cent.)
- Compute the total cost per unit for each product under ABC.
- Classify each of the activities as a value-added activity or a non-value-added activity.
- Comment on (1) the comparative overhead cost per unit for the two products under ABC, and (2) the comparative total costs per unit under traditional costing and ABC.

**P4-2A** Overton Electronics manufactures two large-screen television models: the Royale which sells for \$1,600, and a new model, the Majestic, which sells for \$1,300. The production cost computed per unit under traditional costing for each model in 2011 was as follows.

<b>Traditional Costing</b>	<b>Royale</b>	<b>Majestic</b>
Direct materials	\$ 700	\$420
Direct labor (\$20 per hour)	120	100
Manufacturing overhead (\$38 per DLH)	228	190
Total per unit cost	<u>\$1,048</u>	<u>\$710</u>

In 2011, Overton manufactured 25,000 units of the Royale and 10,000 units of the Majestic. The overhead rate of \$38 per direct labor hour was determined by dividing total expected manufacturing overhead of \$7,600,000 by the total direct labor hours (200,000) for the two models.

Under traditional costing, the gross profit on the models was: Royale \$552 or (\$1,600 – \$1,048), and Majestic \$590 or (\$1,300 – \$710). Because of this difference, management is considering phasing out the Royale model and increasing the production of the Majestic model.

Before finalizing its decision, management asks Overton's controller to prepare an analysis using activity-based costing (ABC). The controller accumulates the following information about overhead for the year ended December 31, 2011.

<b>Activities</b>	<b>Cost Drivers</b>	<b>Estimated Overhead</b>	<b>Expected Use of Cost Drivers</b>	<b>Activity-Based Overhead Rate</b>
Purchasing	Number of orders	\$1,200,000	40,000	\$30/order
Machine setups	Number of setups	900,000	18,000	50/setup
Machining	Machine hours	4,800,000	120,000	40/hour
Quality control	Number of inspections	700,000	28,000	25/inspection

The cost drivers used for each product were:

<b>Cost Drivers</b>	<b>Royale</b>	<b>Majestic</b>	<b>Total</b>
Purchase orders	15,000	25,000	40,000
Machine setups	5,000	13,000	18,000
Machine hours	75,000	45,000	120,000
Inspections	9,000	19,000	28,000

**Instructions**

(a) Royale \$3,925,000

(b) Cost/unit—Royale \$977

- Assign the total 2011 manufacturing overhead costs to the two products using activity-based costing (ABC).
- What was the cost per unit and gross profit of each model using ABC costing?
- Are management's future plans for the two models sound? Explain.

**P4-3A** Skaros Stairs Co. of Moore designs and builds factory-made premium wooden stairways for homes. The manufactured stairway components (spindles, risers, hangers, hand rails) permit installation of stairways of varying lengths and widths. All are of white oak wood. Budgeted manufacturing overhead costs for the year 2011 are as follows.

Overhead Cost Pools	Amount
Purchasing	\$ 57,000
Handling materials	82,000
Production (cutting, milling, finishing)	210,000
Setting up machines	85,000
Inspecting	90,000
Inventory control (raw materials and finished goods)	126,000
Utilities	<u>180,000</u>
Total budget overhead costs	<u><u>\$830,000</u></u>

Assign overhead costs using traditional costing and ABC; compare results.

(SO 1, 4)

For the last 4 years, Skaros Stairs Co. has been charging overhead to products on the basis of machine hours. For the year 2011, 100,000 machine hours are budgeted.

Anthony Morse, owner-manager of Skaros Stairs Co., recently directed his accountant, Neal Seagren, to implement the activity-based costing system that he has repeatedly proposed. At Anthony Morse's request, Neal and the production foreman identify the following cost drivers and their usage for the previously budgeted overhead cost pools.

Activity Cost Pools	Cost Drivers	Expected Use of Cost Drivers
Purchasing	Number of orders	600
Handling materials	Number of moves	8,000
Production (cutting, milling, finishing)	Direct labor hours	100,000
Setting up machines	Number of setups	1,250
Inspecting	Number of inspections	6,000
Inventory control (raw materials and finished goods)	Number of components	168,000
Utilities	Square feet occupied	90,000

David Hannon, sales manager, has received an order for 280 stairways from Community Builders, Inc., a large housing development contractor. At David's request, Neal prepares cost estimates for producing components for 280 stairways so David can submit a contract price per stairway to Community Builders. He accumulates the following data for the production of 280 stairways.

Direct materials	\$103,600
Direct labor	\$112,000
Machine hours	14,500
Direct labor hours	5,000
Number of purchase orders	60
Number of material moves	800
Number of machine setups	100
Number of inspections	450
Number of components	16,000
Number of square feet occupied	8,000

#### Instructions

- (a) Compute the predetermined overhead rate using traditional costing with machine hours as the basis.  
 (b) What is the manufacturing cost per stairway under traditional costing? (Round to the nearest cent.) (b) Cost/stairway \$1,199.82

(c) Cost/stairway \$1,055.54

Assign overhead costs using traditional costing and ABC; compare results.

(SO 1, 4)

- (c) What is the manufacturing cost per stairway under the proposed activity-based costing? (Round to the nearest cent. Prepare all of the necessary schedules.)  
 (d) Which of the two costing systems is preferable in pricing decisions and why?

**P4-4A** Polzin Corporation produces two grades of wine from grapes that it buys from California growers. It produces and sells roughly 3,000,000 liters per year of a low-cost, high-volume product called CoolDay. It sells this in 600,000 5-liter jugs. Polzin also produces and sells roughly 300,000 liters per year of a low-volume, high-cost product called LiteMist. LiteMist is sold in 1-liter bottles. Based on recent data, the CoolDay product has not been as profitable as LiteMist. Management is considering dropping the inexpensive CoolDay line so it can focus more attention on the LiteMist product. The LiteMist product already demands considerably more attention than the CoolDay line.

Greg Kagen, president and founder of Polzin, is skeptical about this idea. He points out that for many decades the company produced only the CoolDay line, and that it was always quite profitable. It wasn't until the company started producing the more complicated LiteMist wine that the profitability of CoolDay declined. Prior to the introduction of LiteMist, the company had simple equipment, simple growing and production procedures, and virtually no need for quality control. Because LiteMist is bottled in 1-liter bottles, it requires considerably more time and effort, both to bottle and to label and box than does CoolDay. The company must bottle and handle 5 times as many bottles of LiteMist to sell the same quantity as CoolDay. CoolDay requires 1 month of aging; LiteMist requires 1 year. CoolDay requires cleaning and inspection of equipment every 10,000 liters; LiteMist requires such maintenance every 600 liters.

Greg has asked the accounting department to prepare an analysis of the cost per liter using the traditional costing approach and using activity-based costing. The following information was collected.

	CoolDay	LiteMist
Direct materials per liter	\$0.40	\$1.20
Direct labor cost per liter	\$0.25	\$0.50
Direct labor hours per liter	0.05	0.09
Total direct labor hours	150,000	27,000

Activity Cost Pools	Cost Drivers	Estimated Overhead	Expected Use of Cost Drivers	Expected Use of Cost Drivers per Product	
				CoolDay	LiteMist
Grape processing	Cart of grapes	\$ 145,860	6,600	6,000	600
Aging	Total months	396,000	6,600,000	3,000,000	3,600,000
Bottling and corking	Number of bottles	270,000	900,000	600,000	300,000
Labeling and boxing	Number of bottles	189,000	900,000	600,000	300,000
Maintain and inspect equipment	Number of inspections	<u>240,800</u>	800	350	450
		<u><u>\$1,241,660</u></u>			

#### Instructions

Answer each of the following questions. (Round all calculations to three decimal places.)

(a) Cost/liter-C.D. \$1.001

(c) Cost/liter-C.D. \$.241

- (a) Under traditional product costing using direct labor hours, compute the total manufacturing cost per **liter** of both products.  
 (b) Under ABC, prepare a schedule showing the computation of the activity-based overhead rates (per cost driver).  
 (c) Prepare a schedule assigning each activity's overhead cost pool to each product, based on the use of cost drivers. Include a computation of overhead cost per liter.  
 (d) Compute the total manufacturing cost per liter for both products under ABC.  
 (e) Write a memo to Greg Kagen discussing the implications of your analysis for the company's plans. In this memo provide a brief description of ABC, as well as an explanation of how the traditional approach can result in distortions.

**P4-5A** Rice and Conwell is a public accounting firm that offers two primary services, auditing and tax return preparation. A controversy has developed between the partners of the two service lines as to who is contributing the greater amount to the bottom line. The area of contention is the assignment of overhead. The tax partners argue for assigning overhead on the basis of 40% of direct labor dollars, while the audit partners argue for implementing activity-based costing. The partners agree to use next year's budgeted data for purposes of analysis and comparison. The following overhead data are collected to develop the comparison.

Assign overhead costs to services using traditional costing and ABC; compute overhead rates and unit costs; compare results.  
(SO 1, 4, 6, 8)



Activity Cost Pools	Cost Drivers	Estimated Overhead	Expected Use of Cost Drivers	Expected Use of Cost Drivers per Service	
				Audit	Tax
Employee training	Direct labor dollars	\$216,000	\$1,800,000	\$1,000,000	\$800,000
Typing and secretarial	Number of reports/forms	76,200	2,500	600	1,900
Computing	Number of minutes	204,000	60,000	25,000	35,000
Facility rental	Number of employees	142,500	40	22	18
Travel	Per expense reports	81,300	Direct	56,000	25,300
		<u>\$720,000</u>			

#### Instructions

- (a) Using traditional product costing as proposed by the tax partners, compute the total overhead cost assigned to both services (audit and tax) of Rice and Conwell.
- (b) (1) Using activity-based costing, prepare a schedule showing the computations of the activity-based overhead rates (per cost driver).
- (2) Prepare a schedule assigning each activity's overhead cost pool to each service based on the use of the cost drivers.
- (c) Classify each of the activities as a value-added activity or a non-value-added activity.
- (d) Comment on the comparative overhead cost for the two services under both traditional costing and ABC.

(b) (2) Cost assigned—Tax \$362,337

(d) Difference—Audit \$42,337

## Problems: Set B

**P4-1B** VideoPlus, Inc. manufactures two types of DVD players, a deluxe model and a standard model. The deluxe model is a multi-format progressive-scan DVD player with networking capability, Dolby digital, and DTS decoder. The standard model's primary feature is progressive-scan. Annual production is 50,000 units for the deluxe and 20,000 units for the standard.

Assign overhead using traditional costing and ABC; compute unit costs; classify activities as value-or non-value-added.

(SO 1, 4, 6)

Both products require 2 hours of direct labor for completion. Therefore, total annual direct labor hours are 140,000 [2 hrs.  $\times$  (20,000 + 50,000)]. Expected annual manufacturing overhead is \$980,000. Thus, the predetermined overhead rate is \$7 (\$980,000  $\div$  140,000) per direct labor hour. The direct materials cost per unit is \$42 for the deluxe model and \$11 for the standard model. The direct labor cost is \$18 per unit for both the deluxe and the standard models.

The company's managers identified six activity cost pools and related cost drivers and accumulated overhead by cost pool as follows.

Activity Cost Pool	Cost Driver	Estimated Overhead	Expected Use of Cost Drivers	Expected Use of Drivers by Product	
				Standard	Deluxe
Purchasing	Orders	\$130,000	400	100	300
Receiving	Pounds	30,000	20,000	4,000	16,000
Assembling	Number of parts	370,000	74,000	20,000	54,000
Testing	Number of tests	115,000	23,000	10,000	13,000
Finishing	Units	140,000	70,000	20,000	50,000
Packing and shipping	Pounds	195,000	80,000	18,000	62,000
		<u>\$980,000</u>			

- Instructions**
- (a) Unit cost—Standard \$43
- (b) Under traditional product costing, compute the total unit cost of both products. Prepare a simple comparative schedule of the individual costs by product (similar to Illustration 4-10 on page 158).
- (c) Under ABC, prepare a schedule showing the computations of the activity-based overhead rates (per cost driver).
- (d) Prepare a schedule assigning each activity's overhead cost pool to each product based on the use of cost drivers. (Include a computation of overhead cost per unit, rounding to the nearest cent.)
- (e) Compute the total cost per unit for each product under ABC.
- (f) Classify each of the activities as a value-added activity or a non-value-added activity.
- (g) Comment on (1) the comparative overhead cost per unit for the two products under ABC, and (2) the comparative total costs per unit under traditional costing and ABC.
- P4-2B** Wilbury Electronics manufactures two home theater systems: the Elite which sells for \$1,400, and a new model, the Preferred, which sells for \$1,100. The production cost computed per unit under traditional costing for each model in 2011 was as follows.
- Assign overhead to products using ABC and evaluate decision.*
- (SO 4)

<b>Traditional Costing</b>	<b>Elite</b>	<b>Preferred</b>
Direct materials	\$600	\$320
Direct labor (\$20 per hour)	100	80
Manufacturing overhead (\$35 per DLH)	<u>175</u>	<u>140</u>
Total per unit cost	<u><u>\$875</u></u>	<u><u>\$540</u></u>

In 2011, Wilbury manufactured 20,000 units of the Elite and 10,000 units of the Preferred. The overhead rate of \$35 per direct labor hour was determined by dividing total expected manufacturing overhead of \$4,900,000 by the total direct labor hours (140,000) for the two models.

Under traditional costing, the gross profit on the models was: Elite \$525 (\$1,400 – \$875), and Preferred \$560 (\$1,100 – \$540). Because of this difference, management is considering phasing out the Elite model and increasing the production of the Preferred model.

Before finalizing its decision, management asks Wilbury's controller to prepare an analysis using activity-based costing (ABC). The controller accumulates the following information about overhead for the year ended December 31, 2011.

<b>Activity</b>	<b>Cost Driver</b>	<b>Estimated Overhead</b>	<b>Expected Use of Cost Drivers</b>	<b>Activity-Based Overhead Rate</b>
Purchasing	Number of orders	\$ 775,000	25,000	\$31
Machine setups	Number of setups	580,000	20,000	29
Machining	Machine hours	3,100,000	100,000	31
Quality control	Number of inspections	445,000	5,000	89

The cost drivers used for each product were:

<b>Cost Driver</b>	<b>Elite</b>	<b>Preferred</b>	<b>Total</b>
Purchase orders	11,250	13,750	25,000
Machine setups	10,000	10,000	20,000
Machine hours	40,000	60,000	100,000
Inspections	2,250	2,750	5,000

**Instructions**

- (a) Elite \$2,079,000
- (b) Cost/unit—Elite \$803.95
- (c) Are management's future plans for the two models sound? Explain.

**P4-3B** Luxury Furniture designs and builds factory-made, premium, wood armoires for homes. All are of white oak. Its budgeted manufacturing overhead costs for the year 2011 are as follows.

Assign overhead costs using traditional costing and ABC; compare results.

(SO 1, 4)

<b>Overhead Cost Pools</b>	<b>Amount</b>
Purchasing	\$ 35,000
Handling materials	50,000
Production (cutting, milling, finishing)	130,000
Setting up machines	55,000
Inspecting	60,000
Inventory control (raw materials and finished goods)	80,000
Utilities	100,000
Total budget overhead costs	<u>\$510,000</u>

For the last 4 years, Luxury Furniture has been charging overhead to products on the basis of materials cost. For the year 2011, materials cost of \$500,000 were budgeted.

Sam Pluemer, owner-manager of Luxury Furniture, recently directed his accountant, Ben Borke, to implement the activity-based costing system that he has repeatedly proposed. At Sam Pluemer's request, Ben and the production foreman identify the following cost drivers and their usage for the previously budgeted overhead cost pools.

<b>Overhead Cost Pools</b>	<b>Activity Cost Drivers</b>	<b>Expected Use of Cost Drivers</b>
Purchasing	Number of orders	500
Handling materials	Number of moves	5,000
Production (cutting, milling, finishing)	Direct labor hours	65,000
Setting up machines	Number of setups	1,000
Inspecting	Number of inspections	4,000
Inventory control (raw materials and finished goods)	Number of components	40,000
Utilities	Square feet occupied	50,000

Tricia Steiner, sales manager, has received an order for 10 luxury armoires from Thom's Interior Design. At Tricia's request, Ben prepares cost estimates for producing 10 armoires so Tricia can submit a contract price per armoire to Thom's. He accumulates the following data for the production of 10 armoires.

Direct materials	\$5,200
Direct labor	\$3,500
Direct labor hours	200
Number of purchase orders	3
Number of material moves	32
Number of machine setups	4
Number of inspections	20
Number of components	640
Number of square feet occupied	320

#### Instructions

- (a) Compute the predetermined overhead rate using traditional costing with materials cost as the basis.
- (b) What is the manufacturing cost per armoire under traditional costing?
- (c) What is the manufacturing cost per armoire under the proposed activity-based costing? (Prepare all of the necessary schedules.)
- (d) Which of the two costing systems is preferable in pricing decisions and why?

(b) Cost/armoire \$1,400.40  
(c) Cost/armoire \$1,207.00

Assign overhead costs using traditional costing and ABC; compare results.

(SO 1, 4)

**P4-4B** Venuchi Corporation produces two grades of wine from grapes that it buys from California growers. It produces and sells roughly 600,000 gallon jugs per year of a low-cost, high-volume product called Valley Fresh. Venuchi also produces and sells roughly 200,000 gallons per year of a low-volume, high-cost product called Venuchi Valley. Venuchi Valley is sold in 1-liter bottles. Based on recent data, the Valley Fresh product has not been as profitable as Venuchi Valley. Management is considering dropping the inexpensive Valley Fresh line so it can focus more attention on the Venuchi Valley product. The Venuchi Valley product already demands considerably more attention than the Valley Fresh line.

Vincent Venuchi, president and founder of Venuchi, is skeptical about this idea. He points out that for many decades the company produced only the Valley Fresh line, and that it was always quite profitable. It wasn't until the company started producing the more complicated Venuchi Valley wine that the profitability of Valley Fresh declined. Prior to the introduction of Venuchi Valley, the company had simple equipment, simple growing and production procedures, and virtually no need for quality control. Because Venuchi Valley is bottled in 1-liter bottles, it requires considerably more time and effort, both to bottle and to label and box, than does Valley Fresh. The company must bottle and handle 4 times as many bottles of Venuchi Valley to sell the same quantity as Valley Fresh, since there are approximately 4 liters in a gallon. Valley Fresh requires 1 month of aging; Venuchi Valley requires 1 year. Valley Fresh requires cleaning and inspection of equipment every 2,500 gallons; Venuchi Valley requires such maintenance every 250 gallons.

Vincent has asked the accounting department to prepare an analysis of the cost per gallon using the traditional costing approach and using activity-based costing. The following information was collected.

	<b>Valley Fresh</b>	<b>Venuchi Valley</b>
Direct materials per gallon	\$1.35	\$3.60
Direct labor cost per gallon	\$0.75	\$1.50
Direct labor hours per gallon	0.05	0.10
Total direct labor hours	30,000	20,000

<b>Activity Cost Pool</b>	<b>Cost Driver</b>	<b>Estimated Overhead</b>	<b>Expected Use of Cost Drivers</b>	<b>Expected Use of Cost Drivers per Product</b>	
				<b>Valley Fresh</b>	<b>Venuchi Valley</b>
Grape processing	Cart of grapes	\$ 120,000	8,000	6,000	2,000
Aging	Total months	420,000	3,000,000	600,000	2,400,000
Bottling and corking	Number of bottles	210,000	1,400,000	600,000	800,000
Labeling and boxing	Number of bottles	140,000	1,400,000	600,000	800,000
Maintain and inspect equipment	Number of inspections	210,000	1,040	240	800
		<u>\$1,100,000</u>			

#### Instructions

Answer each of the following questions. (Round all calculations to three decimal places.)

(a) Cost/gallon–V.F. \$3.200

- (a) Under traditional product costing using direct labor hours, compute the total manufacturing cost per **gallon** of both products.

(c) Cost/gallon–V.F. \$0.621

- (b) Under ABC, prepare a schedule showing the computation of the activity-based overhead rates (per cost driver).

- (c) Prepare a schedule assigning each activity's overhead cost pool to each product, based on the use of cost drivers. Include a computation of overhead cost per gallon.

- (d) Compute the total manufacturing cost per gallon for both products under ABC.

- (e) ➔ Write a memo to Vincent Venuchi discussing the implications of your analysis for the company's plans. In this memo provide a brief description of ABC, as well as an explanation of how the traditional approach can result in distortions.

**P4-5B** Slick and Sly is a law firm that serves both individuals and corporations. A controversy has developed between the partners of the two service lines as to who is contributing the greater amount to the bottom line. The area of contention is the assignment of overhead. The individual partners argue for assigning overhead on the basis of 28.125% of direct labor dollars, while the corporate partners argue for implementing activity-based costing. The partners agree to use next year's budgeted data for purposes of analysis and comparison. The following overhead data are collected to develop the comparison.

Assign overhead costs to services using traditional costing and ABC; compute overhead rates and unit costs; compare results.  
(SO 1, 4, 6, 8)



<b>Activity Cost Pool</b>	<b>Cost Driver</b>	<b>Estimated Overhead</b>	<b>Expected Use of Cost Drivers</b>		<b>Expected Use of Cost Drivers per Service</b>
			<b>Corporate</b>	<b>Individual</b>	
Employee training	Direct labor dollars	\$100,000	\$1,600,000	\$900,000	\$700,000
Typing and secretarial	Number of reports/forms	60,000	2,000	500	1,500
Computing	Number of minutes	120,000	40,000	17,000	23,000
Facility rental	Number of employees	100,000	25	14	11
Travel	Per expense reports	70,000	Direct	48,000	22,000
		<u>\$450,000</u>			

#### Instructions

- (a) Using traditional product costing, compute the total overhead cost assigned to both services (individual and corporate) of Slick and Sly.
- (b) (1) Using activity-based costing, prepare a schedule showing the computations of the activity-based overhead rates (per cost driver).  
(2) Prepare a schedule assigning each activity's overhead cost pool to each service based on the use of the cost drivers.
- (c) Classify each of the activities as a value-added activity or a non-value-added activity.
- (d) Comment on the comparative overhead for the two service lines under both traditional costing and ABC.

(b) (2) Cost assigned—Individual  
\$223,750

(d) Difference—Corporate  
\$26,875



## Problems: Set C

Visit the book's companion website at [www.wiley.com/college/weygandt](http://www.wiley.com/college/weygandt), and choose the Student Companion site, to access Problem Set C.

## Waterways Continuing Problem

(Note: This is a continuation of the Waterways Problem from Chapters 1 through 3.)

**WCP4** Waterways looked into ABC as a method of costing because of the variety of items they produce and the many different activities in which they are involved. This problem asks you to help Waterways use activity-based costing system to account for its production activities.



Go to the book's companion website,  
[www.wiley.com/college/weygandt](http://www.wiley.com/college/weygandt),  
to find the completion of this problem.

## broadening your perspective



### Decision Making Across the Organization



**BYP4-1** East Valley Hospital is a primary medical care facility and trauma center that serves 11 small, rural midwestern communities within a 40-mile radius. The hospital offers all the medical/surgical services of a typical small hospital. It has a staff of 18 full-time doctors and 20 part-time visiting specialists. East Valley has a payroll of 150 employees consisting of technicians, nurses, therapists, managers, directors, administrators, dieticians, secretaries, data processors, and janitors.

#### Instructions

With the class divided into groups, discuss and answer the following.

- Using your (limited, moderate, or in-depth) knowledge of a hospital's operations, identify as many **activities** as you can that would serve as the basis for implementing an activity-based costing system.
- For each of the activities listed in (a), identify a **cost driver** that would serve as a valid measure of the resources consumed by the activity.

### Managerial Analysis

**BYP4-2** Ideal Manufacturing Company of Sycamore, Illinois, has supported a research and development (R&D) department that has for many years been the sole contributor to the company's new farm machinery products. The R&D activity is an overhead cost center that provides services only to in-house manufacturing departments (four different product lines), all of which produce agricultural/farm/ranch related machinery products.

The department has never sold its services outside, but because of its long history of success, larger manufacturers of agricultural products have approached Ideal to hire its R&D department for special projects. Because the costs of operating the R&D department have been spiraling uncontrollably, Ideal's management is considering entertaining these outside approaches to absorb the increasing costs. But, (1) management doesn't have any cost basis for charging R&D services to outsiders, and (2) it needs to gain control of its R&D costs. Management decides to implement an activity-based costing system in order to determine the charges for both outsiders and the in-house users of the department's services.

R&D activities fall into four pools with the following annual costs.

Market analysis	\$1,050,000
Product design	2,280,000
Product development	3,600,000
Prototype testing	1,400,000

Activity analysis determines that the appropriate cost drivers and their usage for the four activities are:

Activities	Cost Drivers	Total Estimated Drivers
Market analysis	Hours of analysis	15,000 hours
Product design	Number of designs	2,500 designs
Product development	Number of products	90 products
Prototype testing	Number of tests	700 tests

#### Instructions

- Compute the activity-based overhead rate for each activity cost pool.
- How much cost would be charged to an in-house manufacturing department that consumed 1,800 hours of market analysis time, was provided 280 designs relating to 10 products, and requested 92 engineering tests?
- How much cost would serve as the basis for pricing an R&D bid with an outside company on a contract that would consume 800 hours of analysis time, require 178 designs relating to 3 products, and result in 70 engineering tests?
- What is the benefit to Ideal Manufacturing of applying activity-based costing to its R&D activity for both in-house and outside charging purposes?

## Real-World Focus

**BYP4-3** Hewlett-Packard (HP) is considered one of the best-managed and most innovative companies in the world. It continually has shown an ability to adapt to global competitive challenges through technical innovation and continual reassessment of its management and control mechanisms. Most applications of activity-based costing by Hewlett-Packard have been successful.

But, over the period August 1988 to August 1989, the Colorado Springs Division of Hewlett-Packard designed an activity-based costing system with the goal of providing for better product costing and inventory valuation. It began implementation in November 1989 but halted the process in the summer of 1992. Since then, the Colorado Springs Division has made no further attempts to re-implement a more expansive ABC approach.

### Instructions

The March 1997 issue of *Management Accounting* contains an article by Steven P. Landry, Larry M. Wood, and Tim M. Linquist about the Colorado Springs Division titled “Can ABC Bring Mixed Results?” Read the article and answer the following questions.

- What went wrong at HP’s Colorado Springs Division in the design, development, and implementation of its activity-based costing system?
- What conclusions were drawn from HP’s Colorado Springs Division experience? What does successful ABC implementation require?

## Exploring the Web

**BYP4-4** Activity-based costing methods are constantly being improved upon, and many websites discuss suggestions for improvement. The article in this activity outlines an alternative perspective on activity-based costing.

**Address:** <http://hbswk.hbs.edu/item/4587.html>, or go to [www.wiley.com/college/weygandt](http://www.wiley.com/college/weygandt)



### Instructions

Read the article provided at the site and answer the following questions.

- What concerns do the authors say are raised by “real-world use” of ABC? According to the authors, what benefits have companies enjoyed from the use of ABC?
- What method do the authors suggest for estimating practical capacity? How important is it to be precise in this estimate?
- Describe the steps that are taken after practical capacity has been estimated.
- What is one of the primary benefits obtained by management in the report entitled “ABC, the Time-Driven Way”? What is an example of how this worked for a real company?

## Communication Activity

**BYP4-5** In our Feature Story about **Super Bakery, Inc.**, we described a virtual corporation as one that consists of a core unit that is supported by a network of outsourced activities. A virtual corporation minimizes investment in human resources, fixed assets, and working capital. The application of ABC to Super Bakery, Inc. is described in an article titled “ABC in a Virtual Corporation” by Tom Davis and Bruce Darling, in the October 1996 issue of *Management Accounting*.

### Instructions

Assume you are the controller of a virtual corporation. Using the article as a basis for your communication, write a summary that answers the following questions.

- What unique strategies and tactics did Super Bakery’s management implement that caused sales to take off and continue to grow at an average rate of 20%?
- Why did Super Bakery’s management feel that it was necessary to install an ABC system?
- What is the main difference between Super Bakery’s ABC system and other manufacturers’ ABC systems?

## Ethics Case

**BYP4-6** Marcus Lim, the cost accountant for Hi-Power Mower Company, recently installed activity-based costing at Hi-Power's St. Louis lawn tractor (riding mower) plant where three models—the 8-horsepower Bladerunner, the 12-horsepower Quickcut, and the 18-horsepower Supercut—are manufactured. Marcus's new product costs for these three models show that the company's traditional costing system had been significantly undercosting the 18-horsepower Supercut. This was due primarily to the lower sales volume of the Supercut compared to the Bladerunner and the Quickcut.

Before completing his analysis and reporting these results to management, Marcus is approached by his friend Ray Pon, who is the production manager for the 18-horsepower Supercut model. Ray has heard from one of Marcus's staff about the new product costs and is upset and worried for his job because the new costs show the Supercut to be losing, rather than making, money.

At first Ray condemns the new cost system, whereupon Marcus explains the practice of activity-based costing and why it is more accurate than the company's present system. Even more worried now, Ray begs Marcus, "Massage the figures just enough to save the line from being discontinued. You don't want me to lose my job do you? Anyway, nobody will know."

Marcus holds firm but agrees to recompute all his calculations for accuracy before submitting his costs to management.

**Instructions**

- Who are the stakeholders in this situation?
- What, if any, are the ethical considerations in this situation?
- What are Marcus's ethical obligations to the company? To his friend?

## "All About You" Activity

**BYP4-7** There are many resources available on the Web to assist people in time management. Some of these resources are designed specifically for college students.

**Instructions**

Go to [http://www.dartmouth.edu/~acskills/videos/video\\_tm.html](http://www.dartmouth.edu/~acskills/videos/video_tm.html) (or do an Internet search of Dartmouth's time-management video). Watch the video and then answer the following questions.

- What are the main tools of time management for students, and what is each used for?
- At what time of day are students most inclined to waste time? What time of day is the best for studying complex topics?
- How can employing time-management practices be a "liberating" experience?
- Why is goal-setting important? What are the characteristics of good goals, and what steps should you take to help you develop your goals?

## Answers to *Insight and Accounting Across the Organization* Questions

### Traveling Light, p. 159

**Q:** Why do airlines charge even higher rates for heavier bags, bags that are odd shapes (e.g. ski bags), and bags with hazardous materials in them?

**A:** Each of these factors increases the costs to the airlines. Heavier baggage is more difficult to handle, thus increasing labor costs. It also uses up more fuel. Bags that are odd shapes complicate handling both for humans and machines. In addition, odd shapes take up more space in the cargo area. Finally, hazardous materials require special handling and storage procedures. All of these factors should be considered by an airline when it decides how much to charge for special baggage.

### Using ABC to Aid in Employee Evaluation, p. 162

**Q:** What positive implications does application of ABC have for the employees of this company?

**A:** ABC will make these employees more aware of which activities cost the company more money. They will be motivated to reduce their use of these activities in order to improve their individual performance.

**What Does NASCAR Have to Do with Breakfast Cereal?, p. 165**

Q: What are the benefits of reducing setup time?

A: Setup time is a non-value-added activity. Customers are not willing to pay extra for more setup time. By reducing the time spent on setups, the company can reduce non-value-added costs. Also, by reducing setup time the company can switch from producing one product to producing a different product more quickly. This enables it to respond to customers' demands more quickly, thus avoiding stock-outs.

**Wasted Effort, p. 170**

Q: Suppose a moving company has historically sold cardboard boxes and tape to its customers. What relevant costs would it consider in deciding whether to provide plastic bins rather than boxes and tape?

A: In deciding whether to provide reusable plastic bins, the moving company would consider the following relevant costs: the cost of the bins (and the number of expected uses), the incremental revenue from boxes versus plastic bins, the lost tape revenue, and the cost of driving out to pick up the bins (they don't have to drive out and pick up the boxes). A potential intangible benefit would be the positive public relations benefit of saying that they were switching to a more environmentally friendly packaging option.

**Authors' Comments on All About You:  
Where Does the Time Go?, p. 171**

In part, the response to this question depends on how broadly you apply the term "value-added activity" when looking at one's life. For example, some value-added activities relate to goals and objectives for school and work. It is important to try to manage your time effectively to maximize your chance of achieving these objectives. But it is also important to identify the other things in life that are important. These would include time with friends, family, your health, and hobbies and activities that you value.

When identifying personal value-added activities, it is important to identify all the things, school-related and otherwise, that matter most to you. In applying the activity-based concepts that you learned in this chapter to your life, try to eliminate the non-value-added activities that reduce your ability to focus on those aspects of life that are really important to you.

**Answers to Self-Study Questions**

1. c 2. c 3. c 4. a 5. b 6. b 7. d 8. b 9. d 10. d 11. c 12. c \*13. d \*14. b



Remember to go back to the navigator box on the chapter-opening page and check off your completed work.