Activity-Based Costing: A Tool to Aid Decision Making

LEARNING OBJECTIVES

After studying Chapter 7, you should be able to:

LO7-1 Understand activity-based costing and how it differs from a traditional costing system.

LO7-2 Assign costs to cost pools using a first-stage allocation.

LO7-3 Compute activity rates for cost pools.

LO7-4 Assign costs to a cost object using a second-stage allocation.

LO7-5 Use activity-based costing to compute product and customer margins.

LO7-6 *(Appendix 7A) Prepare an action analysis report using activity-based costing data and interpret the report.*

Managing Product Complexity

BUSINESS FOCUS

Managers often understand that increasing the variety of raw material inputs used in their products increases costs. For example, **General Mills** studied its 50 varieties of Hamburger Helper and concluded that it could lower costs by discontinuing half of them without alienating customers. **Seagate** studied seven varieties of its computer hard drives and found that only 2% of their parts could be shared by more than one hard drive. The engineers fixed the problem by redesigning the hard drives so that they used more common component parts. Instead of using 61 types of screws to make the hard drives, the engineers reduced the number of screws needed to 19. Eventually all Seagate products were designed so that 75% of their component parts were shared with other product lines.

Activity-based costing systems quantify the increase in costs, such as procurement costs, material handling costs, and assembly costs that are caused by inefficient product designs and other factors. ■

Sources: Mina Kimes, "Cereal Cost Cutters," Fortune, *November 10, 2008, p. 24; Erika Brown, "Drive Fast, Drive Hard,"* Forbes, *January 9, 2006, pp. 92–96.*

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This chapter introduces the concept of *activity-based costing* which has been embraced by a wide variety of organizations including **Charles Schwab**, **Citigroup**, **Lowe's**, **Coca-Cola**, **J&B Wholesale**, **Fairchild Semiconductor**, **Assan Aluminum**, **Sysco Foods**, **Fisher Scientific International**, and **Peregrine Outfitters**.

Activity-based costing (ABC) is a costing method that is designed to provide managers with cost information for strategic and other decisions that potentially affect capacity and therefore "fixed" as well as variable costs. Activity-based costing is ordinarily used as a supplement to, rather than as a replacement for, a company's usual costing system. Most organizations that use activity-based costing have two costing systems—the official costing system that is used for preparing external financial reports and the activity-based costing system that is used for internal decision making and for managing activities.

This chapter focuses primarily on ABC applications in manufacturing to provide a contrast with the material presented in earlier chapters. More specifically, Chapters 3 and 4 focused on traditional absorption costing systems used by manufacturing companies to calculate unit product costs for the purpose of valuing inventories and determining cost of goods sold for external financial reports. In contrast, this chapter explains how manufacturing companies can use activity-based costing rather than traditional methods to calculate unit product costs for the purposes of managing overhead and making decisions. Chapter 6 had a similar purpose. That chapter focused on how to use variable costing to aid decisions that do not affect fixed costs. This chapter extends that idea to show how activity-based costing can be used to aid decisions that potentially affect fixed costs as well as variable costs.

Activity-Based Costing: An Overview

LO7-1

Understand activity-based costing and how it differs from a traditional costing system.

As stated above, traditional absorption costing is designed to provide data for external financial reports. In contrast, activity-based costing is designed to be used for internal decision making. As a consequence, activity-based costing differs from traditional absorption costing in three ways. In activity-based costing:

1. Nonmanufacturing as well as manufacturing costs may be assigned to products, but only on a cause-and-effect basis.
2. Some manufacturing costs may be excluded from product costs.
3. Numerous overhead cost pools are used, each of which is allocated to products and other cost objects using its own unique measure of activity.

Each of these departures from traditional absorption costing will be discussed in turn.

Nonmanufacturing Costs and Activity-Based Costing

In traditional absorption costing, manufacturing costs are assigned to products and nonmanufacturing costs are not assigned to products. Conversely, in activity-based costing, we recognize that many nonmanufacturing costs relate to selling, distributing, and servicing specific products. Thus, ABC includes manufacturing *and* nonmanufacturing costs when calculating the entire cost of a product rather than just its manufacturing cost.

There are two types of nonmanufacturing costs that ABC systems assign to products. First, ABC systems trace all direct nonmanufacturing costs to products. Commissions paid to salespersons, shipping costs, and warranty repair costs are examples of nonmanufacturing costs that can be directly traced to individual products. Second, ABC systems allocate indirect nonmanufacturing costs to products whenever the products have presumably caused the costs to be incurred. In fact, in this chapter, we emphasize this point by expanding the definition of *overhead* to include all indirect costs—manufacturing and nonmanufacturing.

In summary, ABC product cost calculations include all direct costs that can be traced to products and all indirect costs that are caused by products. The need to distinguish between manufacturing and nonmanufacturing costs disappears—which is very different from earlier chapters that focused solely on determining the manufacturing cost of a product.

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Manufacturing Costs and Activity-Based Costing

In traditional absorption costing systems, *all* manufacturing costs are assigned to products—even manufacturing costs that are not caused by the products. For example, in Chapter 3 we learned that a predetermined plantwide overhead rate is computed by dividing *all* budgeted manufacturing overhead costs by a measure of budgeted activity such as direct labor-hours. This approach spreads *all* manufacturing overhead costs across products based on each product's direct labor-hour usage. In contrast, activity-based costing systems purposely do not assign two types of manufacturing overhead costs to products.

Manufacturing overhead includes costs such as the factory security guard's wages, the plant controller's salary, and the cost of supplies used by the plant manager's secretary. These types of costs are assigned to products in a traditional absorption costing system even though they are totally unaffected by which products are made during a period. In contrast, activity-based costing systems do not arbitrarily assign these types of costs, which are called *organization-sustaining* costs, to products. Activity-based costing treats these types of costs as period expenses rather than product costs.

Additionally, in a traditional absorption costing system, the costs of unused, or idle, capacity are assigned to products. If the budgeted level of activity declines, the overhead rate and unit product costs increase as the increasing costs of idle capacity are spread over a smaller base. In contrast, in activity-based costing, products are only charged for the costs of the capacity they use—not for the costs of capacity they don't use. This provides more stable unit product costs and is consistent with the goal of assigning to products only the costs of the resources that they use.[1]

Exhibit 7-1 summarizies the two departures from traditional absorption costing that we have discussed thus far. The top portion of the exhibit shows that traditional absorption costing treats all manufacturing costs as product costs and all nonmanufacturing costs as period costs. The bottom portion of the exhibit shows that activity-based costing expands the definition of *overhead* to include all indirect costs—manufacturing and nonmanufacturing. The overhead costs that are caused by products are allocated to them, whereas any overhead costs that are not caused by products are treated as period costs. It also shows that ABC treats direct nonmanufacturing costs as product costs rather than period costs.

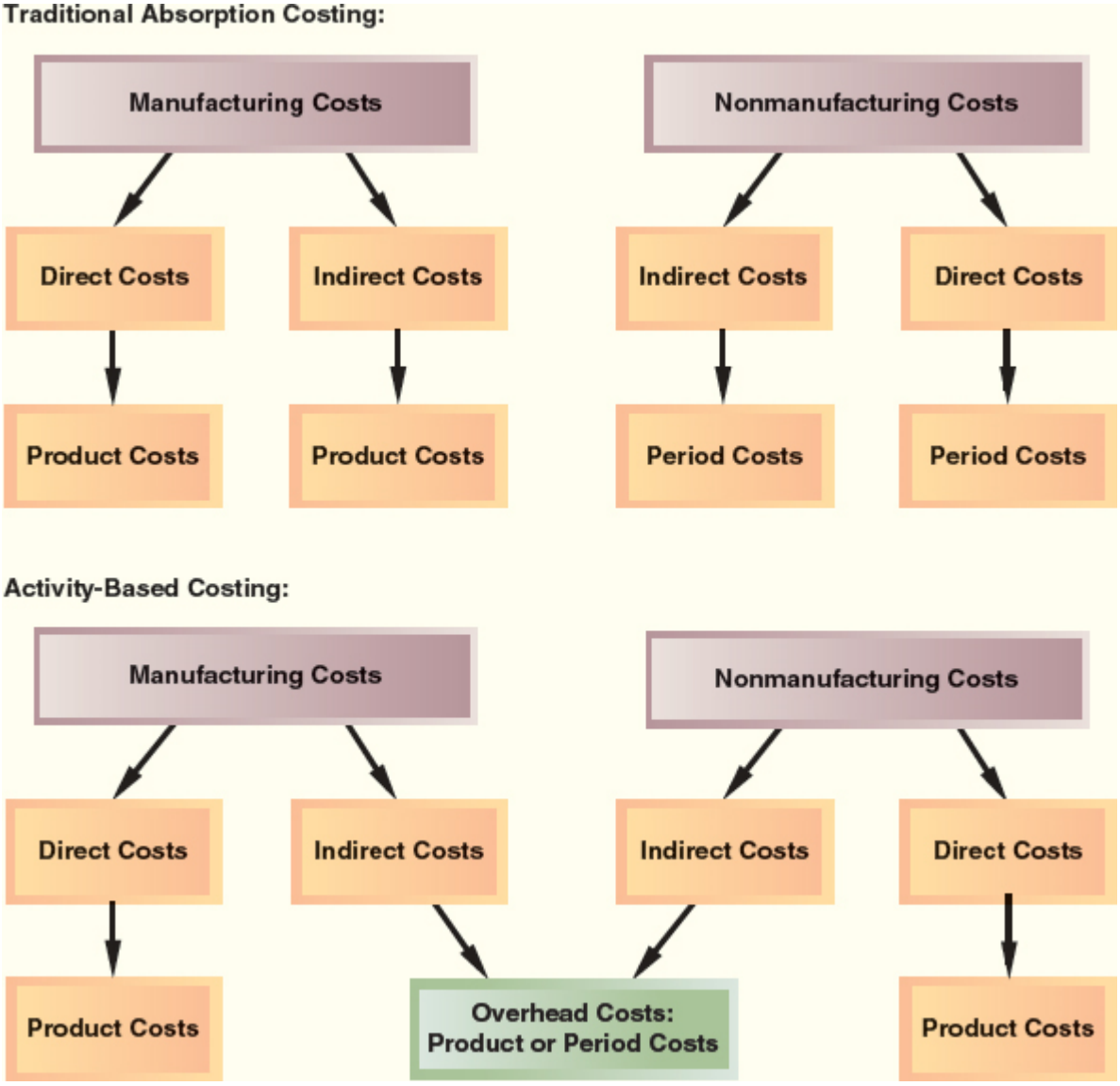
Now we turn our attention to the third and final difference between traditional absorption costing and activity-based costing.

Cost Pools, Allocation Bases, and Activity-Based Costing

Throughout the 19th century and most of the 20th century, cost system designs were simple and satisfactory. Typically, either one plantwide overhead cost pool or a number of departmental overhead cost pools were used to assign overhead costs to products. The plantwide and departmental approaches always had one thing in common—they relied on allocation bases such as direct labor-hours and machine-hours for allocating overhead costs to products. In the labor-intensive production processes of many years ago, direct labor was the most common choice for an overhead allocation

base because it represented a large component of product costs, direct labor-hours were closely tracked, and many managers believed that direct labor-hours, the total volume of units produced, and overhead costs were highly correlated. (Three variables, such as direct labor-hours, the total volume of units produced, and overhead costs, are highly correlated if they tend to move together.) Given that most companies at the time were producing a very limited variety of products that required similar resources to produce, allocation bases such as direct labor-hours, or even machine-hours, worked fine because, in fact, there was probably little difference in the overhead costs attributable to different products.

EXHIBIT 7-1
Differences between Traditional Absorption Costing and Activity-Based Costing



Then conditions began to change. As a percentage of total cost, direct labor began declining and overhead began increasing. Many tasks previously done by direct laborers were being performed by automated equipment—a component of overhead. Companies began creating new products and services at an ever-accelerating rate that differed in volume, batch size, and complexity. Managing and sustaining this product diversity required investing in many more overhead resources, such as production schedulers and product design engineers, that had no obvious connection to direct labor-

hours or machine-hours. In this new environment, continuing to rely exclusively on a limited number of overhead cost pools and traditional allocation bases posed the risk that reported unit product costs would be distorted and, therefore, misleading when used for decision-making purposes.

Activity-based costing, thanks to advances in technology that make more complex cost systems feasible, provides an alternative to the traditional plantwide and departmental approaches to defining cost pools and selecting allocation bases. The activity-based approach has appeal in today's business environment because it uses more cost pools and unique measures of activity to better understand the costs of managing and sustaining product diversity.

In activity-based costing, an **activity** is any event that causes the consumption of overhead resources. An **activity cost pool** is a "bucket" in which costs are accumulated that relate to a single activity measure in the ABC system. An **activity measure** is an allocation base in an activity-based costing system. The term *cost driver* is also used to refer to an activity measure because the activity measure should "drive" the cost being allocated. The two most common types of activity measures are *transaction drivers* and *duration drivers.* **Transaction drivers** are simple counts of the number of times an activity occurs, such as the number of bills sent out to customers. **Duration drivers** measure the amount of time required to perform an activity, such as the time spent preparing individual bills for customers. In general, duration drivers are more accurate measures of resource consumption than transaction drivers, but they take more effort to record. For that reason, transaction drivers are often used in practice.

IN BUSINESS

A CRITICAL PERSPECTIVE OF ABC

Marconi is a Portuguese telecommunications company that encountered problems with its ABC system. The company's production managers felt that 23% of the costs included in the system were common costs that should not be allocated to products and that allocating these costs to products was not only inaccurate, but also irrelevant to their operational cost reduction efforts. Furthermore, Marconi's front-line workers resisted the ABC system because they felt it might be used to weaken their autonomy and to justify downsizing, outsourcing, and work intensification. They believed that ABC created a "turkeys queuing for Christmas syndrome" because they were expected to volunteer information to help create a cost system that could eventually lead to their demise. These two complications created a third problem—the data necessary to build the ABC cost model was provided by disgruntled and distrustful employees. Consequently, the accuracy of the data was questionable at best. In short, Marconi's experiences illustrate some of the challenges that complicate real-world ABC implementations.

Source: Maria Major and Trevor Hopper, "Managers Divided: Implementing ABC in a Portuguese Telecommunications Company," *Management Accounting Research*, June 2005, pp. 205–229.

Traditional cost systems rely exclusively on allocation bases that are driven by the volume of production. On the other hand, activity-based costing defines five levels of activity—unit-level, batch-level, product-level, customer-level, and organization-sustaining—that largely do *not* relate to the volume of units produced. The costs and corresponding activity measures for unit-level activities do relate to the volume of units produced; however, the remaining categories do not. These levels are described as follows:[2]

1. **Unit-level activities** are performed each time a unit is produced. The costs of unit-level activities should be proportional to the number of units produced. For example, providing power to run processing equipment would be a unit-level activity because power tends to be consumed in proportion to the number of units produced.
2. **Batch-level activities** are performed each time a batch is handled or processed, regardless of how many units are in the batch. For example, tasks such as placing

purchase orders, setting up equipment, and arranging for shipments to customers are batch-level activities. They are incurred once for each batch (or customer order). Costs at the batch level depend on the number of batches processed rather than on the number of units produced, the number of units sold, or other measures of volume. For example, the cost of setting up a machine for batch processing is the same regardless of whether the batch contains one or thousands of items.

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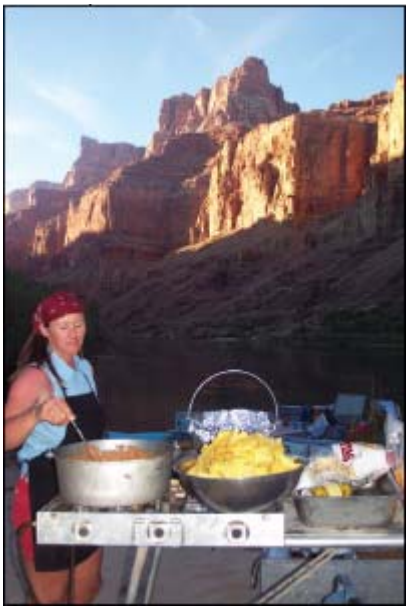
3. **Product-level activities** relate to specific products and typically must be carried out regardless of how many batches are run or units of product are produced or sold. For example, activities such as designing a product, advertising a product, and maintaining a product manager and staff are all product-level activities.
4. **Customer-level activities** relate to specific customers and include activities such as sales calls, catalog mailings, and general technical support that are not tied to any specific product.
5. **Organization-sustaining activities** are carried out regardless of which customers are served, which products are produced, how many batches are run, or how many units are made. This category includes activities such as heating the factory, cleaning executive offices, providing a computer network, arranging for loans, preparing annual reports to shareholders, and so on.

Many companies throughout the world continue to base overhead allocations on direct labor-hours or machine-hours. In situations where overhead costs and direct labor-hours are highly correlated or in situations where the goal of the overhead allocation process is to prepare external financial reports, this practice makes sense. However, if plantwide overhead costs do not move in tandem with plantwide direct labor-hours or machine-hours, product costs will be distorted—with the potential of distorting decisions made within the company.

IN BUSINESS

DINING IN THE CANYON



Western River Expeditions (www.westernriver.com) runs river rafting trips on the Colorado, Green, and Salmon rivers. One of its most popular trips is a six-day trip down the Grand Canyon, which features famous rapids such as Crystal and Lava Falls as well as the awesome scenery accessible only from the bottom of the Grand Canyon. The company runs trips of one or two rafts, each of which carries two guides and up to 18 guests. The company provides all meals on the trip, which are prepared by the guides.

In terms of the hierarchy of activities, a guest can be considered as a unit and a raft as a batch. In that context, the wages paid to the guides are a batch-level cost because each raft requires two guides regardless of the number of guests in the raft. Each guest is given a mug to use during the trip and to take home at the end of the trip as a souvenir. The cost of the mug is a unit-level cost because the number of mugs given away is strictly proportional to the number of guests on a trip.

What about the costs of food served to guests and guides—is this a unit-level cost, a batch-level cost, a product-level cost, or an organization-sustaining cost? At first glance, it might be thought that food costs are a unit-level cost—the greater the number of guests, the higher the food costs. However, that is not quite correct. Standard menus have been created for each day of the trip. For example, the first night's menu might consist of shrimp cocktail, steak, cornbread, salad, and cheesecake. The day before a trip begins, all of the food needed for the trip is taken from the central warehouse and packed in modular containers. It isn't practical to finely adjust the amount of food for the actual number of guests planned to be on a trip—most of the food comes prepackaged in large lots. For example, the shrimp cocktail menu may call for two large bags of frozen shrimp per raft and that many bags will be packed regardless of how many guests are expected on the raft. Consequently, the costs of food are not a unit-level cost that varies with the number of guests actually on a trip. Instead, the costs of food are a batch-level cost.

Source: Conversations with Western River Expeditions personnel.

Designing an Activity-Based Costing (ABC) System

There are three essential characteristics of a successful activity-based costing implementation. First, top managers must strongly support the ABC implementation because their leadership is instrumental in properly motivating all employees to embrace the need to change. Second, top managers should ensure that ABC data is linked to how people are evaluated and rewarded. If employees continue to be evaluated and rewarded using traditional (non-ABC) cost data, they will quickly get the message that ABC is not important and they will abandon it. Third, a cross-functional team should be created to design and implement the ABC system. The team should include representatives from each area that will use ABC data, such as the marketing, production, engineering, and accounting departments. These cross-functional employees possess intimate knowledge of many parts of an organization's operations that is necessary for designing an effective ABC system. Furthermore, tapping the knowledge of cross-functional managers lessens their resistance to ABC because they feel included in the implementation process. Time after time, when accountants have attempted to implement an ABC system on their own without top-management support and cross-functional involvement, the results have been ignored. Classic Brass, Inc., makes two main product lines for luxury yachts—standard stanchions and custom compass housings. The president of the company, John Towers, recently attended a management conference at which activity-based costing was discussed. Following the conference, he called a meeting of the company's top managers to discuss what he had learned. Attending the meeting were production manager Susan Richter, the marketing manager Tom Olafson, and the accounting manager Mary Goodman. He began the conference by distributing the company's income statement that Mary Goodman had prepared a few hours earlier (see Exhibit 7-2):

IN BUSINESS

IMPLEMENTING ACTIVITY-BASED COSTING IN CHINA

Xu Ji Electric Company is publicly traded on China's Shen Zhen Stock Exchange. From 2001–2003, it successfully implemented an activity-based costing (ABC) system because top-level managers continuously supported the new system—particularly during a challenging phase when the ABC software encountered problems. The ABC adoption was also aided by Xu Ji's decision to drive the implementation using a top-down approach, which is aligned with the company's cultural norm of deferring to and supporting the hierarchical chain of command.

Xu Ji's experience is similar to Western ABC implementations that have consistently recognized the necessity of top-level management support. However, contrary to Xu Ji's experience, many Western managers do not readily support the top-down implementation of new management innovations in their organizations. They prefer to be involved in the decision-making processes that introduce change into their organizations.

Source: Lana Y.J. Liu and Fei Pan, "The Implementation of Activity-Based Costing in China: An Innovation Action Research Approach," *The British Accounting Review* 39, 2007, pp. 249–264.

John: Well, it's official. Our company has sunk into the red for the first time in its history—a loss of $1,250.

Tom: I don't know what else we can do! Given our successful efforts to grow sales of the custom compass housings, I was expecting to see a boost to our bottom line, not a net loss. Granted, we have been losing even more bids than usual for standard stanchions because of our recent price increase, but…

John: Do you think our prices for standard stanchions are too high?

EXHIBIT 7-2
Classic Brass Income Statement

Classic Brass
Income Statement
Year Ended December 31, 2014

Sales		$3,200,000
Cost of goods sold:		
Direct materials	$ 975,000	
Direct labor	351,250	
Manufacturing overhead*	1,000,000	2,326,250
Gross margin		873,750
Selling and administrative expenses:		
Shipping expenses	65,000	
General administrative expenses	510,000	
Marketing expenses	300,000	875,000
Net operating loss		$ (1,250)

*The company's traditional cost system allocates manufacturing overhead to products using a plantwide overhead rate and machine-hours as the allocation base. Inventory levels did not change during the year.

Tom: No, I don't think our prices are too high. I think our competitors' prices are too low. In fact, I'll bet they are pricing below their cost.

Susan: Why would our competitors price below their cost?

Tom: They are out to grab market share.

Susan: What good is more market share if they are losing money on every unit sold?

John: I think Susan has a point. Mary, what is your take on this?

Mary: If our competitors are pricing standard stanchions below cost, shouldn't they be losing money rather than us? If our company is the one using accurate information to make informed decisions while our competitors are supposedly clueless, then why is our "bottom line" taking a beating? Unfortunately, I think we may be the ones relying on distorted cost data, not our competitors.

John: Based on what I heard at the conference that I just attended, I am inclined to agree. One of the presentations at the conference dealt with activity-based costing. As the speaker began describing the usual insights revealed by activity-based costing systems, I was sitting in the audience getting an ill feeling in my stomach.

Mary: Honestly John, I have been claiming for years that our existing cost system is okay for external reporting, but it is dangerous to use it for internal decision making. It sounds like you are on board now, right?

John: Yes.

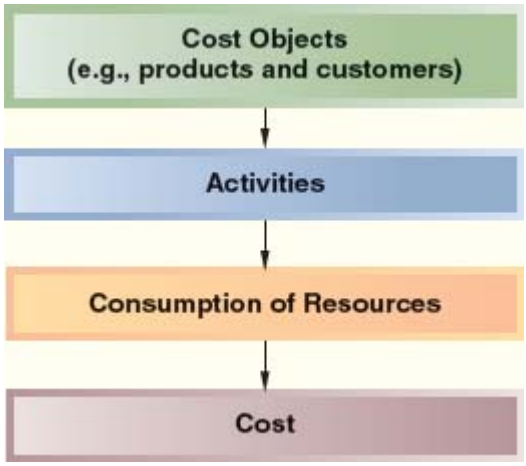
Mary: Well then, how about if all of you commit the time and energy to help me build a fairly simple activity-based costing system that may shed some light on the problems we are facing?

John: Let's do it. I want each of you to appoint one of your top people to a special "ABC team" to investigate how we cost products.

Like most other ABC implementations, the ABC team decided that its new ABC system would supplement, rather than replace, the existing cost accounting system, which would continue to be used for external financial reports. The new ABC system would be used to prepare special reports for management decisions such as bidding on new business.

The accounting manager drew the chart appearing in Exhibit 7-3 to explain the general structure of the ABC model to her team members. Cost objects such as products generate activities. For example, a customer order for a custom compass housing requires the activity of preparing a production order. Such an activity consumes resources. A production order uses a sheet of paper and takes time to fill out. And consumption of resources causes costs. The greater the number of sheets used to fill out production orders and the greater the amount of time devoted to filling out such orders, the greater the cost. Activity-based costing attempts to trace through these relationships to identify how products and customers affect costs.

EXHIBIT 7-3
The Activity-Based Costing Model



As in most other companies, the ABC team at Classic Brass felt that the company's traditional cost accounting system adequately measured the direct materials and direct labor costs of products because these costs are directly traced to products. Therefore, the ABC study would be concerned solely with the other costs of the company—manufacturing overhead and selling and administrative costs.

The team felt it was important to carefully plan how it would go about implementing the new ABC system at Classic Brass. Accordingly, it broke down the implementation process into five steps:

Steps for Implementing Activity-Based Costing:

1. Define activities, activity cost pools, and activity measures.
2. Assign overhead costs to activity cost pools.
3. Calculate activity rates.
4. Assign overhead costs to cost objects using the activity rates and activity measures.
5. Prepare management reports.

Step 1: Define Activities, Activity Cost Pools, and Activity Measures

The first major step in implementing an ABC system is to identify the activities that will form the foundation for the system. This can be difficult and time-consuming and involves a great deal of judgment. A common procedure is for the individuals on the ABC implementation team to interview people who work in overhead departments and ask them to describe their major activities. Ordinarily, this results in a very long list of activities.

The length of such lists of activities poses a problem. On the one hand, the greater the number of activities tracked in the ABC system, the more accurate the costs are likely to be. On the other hand,

a complex system involving large numbers of activities is costly to design, implement, maintain, and use. Consequently, the original lengthy list of activities is usually reduced to a handful by combining similar activities. For example, several actions may be involved in handling and moving raw materials—from receiving raw materials on the loading dock to sorting them into the appropriate bins in the storeroom. All of these activities might be combined into a single activity called material handling.

When combining activities in an ABC system, activities should be grouped together at the appropriate level. Batch-level activities should not be combined with unit-level

activities or product-level activities with batch-level activities and so on. In general, it is best to combine only those activities that are highly correlated with each other within a level. For example, the number of customer orders received is likely to be highly correlated with the number of completed customer orders shipped, so these two batch-level activities (receiving and shipping orders) can usually be combined with little loss of accuracy.

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At Classic Brass, the ABC team, in consultation with top managers, selected the following *activity cost pools* and *activity measures:*

Activity Cost Pools at Classic Brass

Activity Cost Pool	Activity Measure
Customer orders	Number of customer orders
Product design	Number of product designs
Order size	Machine-hours
Customer relations	Number of active customers
Other	Not applicable

The *Customer Orders* cost pool will be assigned all costs of resources that are consumed by taking and processing customer orders, including costs of processing paperwork and any costs involved in setting up machines for specific orders. The activity measure for this cost pool is the number of customer orders received. This is a batch-level activity because each order generates work that occurs regardless of whether the order is for one unit or 1,000 units.

The *Product Design* cost pool will be assigned all costs of resources consumed by designing products. The activity measure for this cost pool is the number of products designed. This is a product-level activity because the amount of design work on a new product does not depend on the number of units ultimately ordered or batches ultimately run.

The *Order Size* cost pool will be assigned all costs of resources consumed as a consequence of the number of units produced, including the costs of miscellaneous factory supplies, power to run machines, and some equipment depreciation. This is a unit-level activity because each unit requires some of these resources. The activity measure for this cost pool is machine-hours.

The *Customer Relations* cost pool will be assigned all costs associated with maintaining relations with customers, including the costs of sales calls and the costs of entertaining customers. The activity measure for this cost pool is the number of customers the company has on its active customer list. The Customer Relations cost pool represents a customer-level activity.

The *Other* cost pool will be assigned all overhead costs that are not associated with customer orders, product design, the size of the orders, or customer relations. These costs mainly consist of organization-sustaining costs and the costs of unused, idle capacity. These costs *will not* be assigned to products because they represent resources that are *not* consumed by products.

It is unlikely that any other company would use exactly the same activity cost pools and activity measures that were selected by Classic Brass. Because of the amount of judgment involved, the number and definitions of the activity cost pools and activity measures used by companies vary considerably.

The Mechanics of Activity-Based Costing

Step 2: Assign Overhead Costs to Activity Cost Pools

LO7-2

Assign costs to cost pools using a first-stage allocation.

Exhibit 7-4 shows the annual overhead costs (both manufacturing and nonmanufacturing) that Classic Brass intends to assign to its activity cost pools. Notice the data in the exhibit are organized by department (e.g., Production, General Administrative, and Marketing). This is because the data have been extracted from the company's general ledger. General ledgers usually classify costs within the departments where the costs are incurred. For example, salaries, supplies, rent, and so forth incurred in the marketing department are charged to that department. The functional orientation of the general ledger mirrors the presentation of costs in the absorption income statement in Exhibit 7-2. In fact, you'll notice the total costs for the Production Department in Exhibit 7-4 ($1,000,000) equal the total manufacturing overhead costs from the income statement in Exhibit 7-2. Similarly, the total costs for the General Administrative and Marketing Departments in Exhibit 7-4 ($510,000 and $300,000) equal the marketing and general and administrative expenses shown in Exhibit 7-2.

EXHIBIT 7-4
Annual Overhead Costs (Both Manufacturing and Nonmanufacturing) at Classic Brass

Production Department:		
Indirect factory wages	$500,000	
Factory equipment depreciation	300,000	
Factory utilities	120,000	
Factory building lease	80,000	$1,000,000
General Administrative Department:		
Administrative wages and salaries	400,000	
Office equipment depreciation	50,000	
Administrative building lease	60,000	510,000
Marketing Department:		
Marketing wages and salaries	250,000	
Selling expenses	50,000	300,000
Total overhead cost		$1,810,000

Three costs included in the income statement in Exhibit 7-2—direct materials, direct labor, and shipping—are excluded from the costs shown in Exhibit 7-4. The ABC team purposely excluded these costs from Exhibit 7-4 because the existing cost system can accurately trace direct materials, direct labor, and shipping costs to products. There is no need to incorporate these direct costs in the activity-based allocations of indirect costs.

Classic Brass's activity-based costing system will divide the nine types of overhead costs in Exhibit 7-4 among its activity cost pools via an allocation process called *first-stage allocation.* The **first-stage allocation** in an ABC system is the process of assigning functionally organized overhead costs derived from a company's general ledger to the activity cost pools.

First-stage allocations are usually based on the results of interviews with employees who have first-hand knowledge of the activities. For example, Classic Brass needs to allocate $500,000 of indirect factory wages to its five activity cost pools. These allocations will be more accurate if the employees who are classified as indirect factory workers (e.g., supervisors, engineers, and quality inspectors) are asked to estimate what percentage of their time is spent dealing with customer orders, with product design, with processing units of product (i.e., order size), and with customer relations. These interviews are conducted with considerable care. Those who are interviewed must thoroughly understand what the activities encompass and what is expected of them in the interview. In addition, departmental managers are typically interviewed to determine how the non-personnel costs should be distributed across the activity cost pools. For example, the Classic Brass production manager would be interviewed to determine how the $300,000 of factory equipment depreciation (shown in Exhibit 7-4) should be allocated to the activity cost pools. The key question that the production manager would need to answer is “What percentage of the available machine capacity is consumed by each activity such as the number of customer orders or the number of units processed (i.e., size of orders)?”

The results of the interviews at Classic Brass are displayed in Exhibit 7-5. For example, factory equipment depreciation is distributed 20% to Customer Orders, 60% to Order Size, and 20% to the Other cost pool. The resource in this instance is machine time. According to the estimates made by the production manager, 60% of the total available machine time was used to actually process units to fill orders. This percentage is entered in the Order Size column. Each customer order requires setting up, which also requires machine time. This activity consumes 20% of the total available machine time and is entered under the Customer Orders column. The remaining 20% of available machine time represents idle time and is entered under the Other column.

EXHIBIT 7–5

Results of Interviews: Distribution of Resource Consumption across Activity Cost Pools

	Activity Cost Pools					
	Customer Orders	*Product Design*	*Order Size*	*Customer Relations*	*Other*	*Totals*
Production Department:						
Indirect factory wages	25%	40%	20%	10%	5%	100%
Factory equipment depreciation	20%	0%	60%	0%	20%	100%
Factory utilities	0%	10%	50%	0%	40%	100%
Factory building lease	0%	0%	0%	0%	100%	100%
General Administrative Department:						
Administrative wages and salaries	15%	5%	10%	30%	40%	100%
Office equipment depreciation	30%	0%	0%	25%	45%	100%
Administrative building lease	0%	0%	0%	0%	100%	100%
Marketing Department:						
Marketing wages and salaries	22%	8%	0%	60%	10%	100%
Selling expenses	10%	0%	0%	70%	20%	100%

Exhibit 7-5 | Exhibit 7-6 | Exhibit 7-7 | Exhibit 7-9 | Exhibit 7-10 | Exhibit 7-11 | Exhibit 7-11 (2)

EXHIBIT 7–6

First-Stage Allocations to Activity Cost Pools

	Activity Cost Pools					
	Customer Orders	*Product Design*	*Order Size*	*Customer Relations*	*Other*	*Totals*
Production Department:						
Indirect factory wages	$ 125,000	$ 200,000	$ 100,000	$ 50,000	$ 25,000	$ 500,000
Factory equipment depreciation	60,000	0	180,000	0	60,000	300,000
Factory utilities	0	12,000	60,000	0	48,000	120,000
Factory building lease	0	0	0	0	80,000	80,000
General Administrative Department:						
Administrative wages and salaries	60,000	20,000	40,000	120,000	160,000	400,000
Office equipment depreciation	15,000	0	0	12,500	22,500	50,000
Administrative building lease	0	0	0	0	60,000	60,000
Marketing Department:						
Marketing wages and salaries	55,000	20,000	0	150,000	25,000	250,000
Selling expenses	5,000	0	0	35,000	10,000	50,000
Total	$ 320,000	$ 252,000	$ 380,000	$ 367,500	$ 490,500	$ 1,810,000

Exhibit 7-5 | Exhibit 7-6 | Exhibit 7-7 | Exhibit 7-9 | Exhibit 7-10 | Exhibit 7-11 | Exhibit 7-11 (2)

Exhibit 7–5 shows that Customer Orders consume 25% of the resources represented by the $500,000 of indirected factory wages.

25% × $500,000 = $125,000

Other entries in the table are computed in a similar fashion.

IN BUSINESS

AN ABC APPLICATION IN THE CONSTRUCTION INDUSTRY

Researchers from the United States and the Republic of Korea studied how a Korean manufacturer assigned the indirect costs of supplying reinforced steel bars (also called *rebar*) to various construction projects. The company's traditional cost system assigned all indirect costs to projects using rebar tonnage as the allocation base. Its ABC system had 10 activities that assigned indirect costs to projects using activity measures such as number of orders, number of sheets, number of distributing runs, number of production runs, and number of inspections.

The traditional and ABC systems assigned the following overhead costs to three construction projects called Commercial, High-Rise Condo, and Heavy Civil:

	Commercial	High-Rise Condo	Heavy Civil
Traditional cost system allocations	$ 64,587	$ 50,310	$91,102
ABC allocations	90,466	61,986	53,548
Difference	$(25,879)	$(11,676)	$37,554

Notice that the traditional cost system was undercosting the Commercial and High-Rise Condo projects relative to the ABC system. It was also overcosting the Heavy Civil project by $37,554 when compared to the ABC system.

Source: Yong-Woo Kim, Seungheon Han, "Sungwon Shin, and Kunhee Choi, "A Case Study of Activity-Based Costing in Allocation Rebar Fabrication Costs to Projects," *Construction Management and Economics,* May 2010, pp. 449–461.

Exhibit 7-5 and many of the other exhibits in this chapter are presented in the form of Excel spreadsheets. All of the calculations required in activity-based costing can be done by hand. Nevertheless, setting up an activity-based costing system on a spreadsheet or using special ABC software can save a lot of work—particularly in situations involving many activity cost pools and in organizations that periodically update their ABC systems.

We will not go into the details of how all of the percentages in Exhibit 7-5 were determined. However, note that 100% of the factory building lease has been assigned to the Other cost pool. Classic Brass has a single production facility. It has no plans to expand or to sublease any excess space. The cost of this production facility is treated as an organization-sustaining cost because there is no way to avoid even a portion of this cost if a particular product or customer were to be dropped. (Remember that organization-sustaining costs are assigned to the Other cost pool and are not allocated to products.) In contrast, some companies have separate facilities for manufacturing specific products. The costs of these separate facilities could be directly traced to the specific products.

Once the percentage distributions in Exhibit 7-5 have been established, it is easy to allocate costs to the activity cost pools. The results of this first-stage allocation are displayed in Exhibit 7-6. Each cost is allocated across the activity cost pools by multiplying it by the percentages in Exhibit 7-5. For

example, the indirect factory wages of $500,000 are multiplied by the 25% entry under Customer Orders in Exhibit 7-5 to arrive at the $125,000 entry under Customer Orders in Exhibit 7-6. Similarly, the indirect factory wages of $500,000 are multiplied by the 40% entry under Product Design in Exhibit 7-5 to arrive at the $200,000 entry under Product Design in Exhibit 7-6. All of the entries in Exhibit 7-6 are computed in this way.

Now that the first-stage allocations to the activity cost pools have been completed, the next step is to compute the activity rates.

Page 299

Step 3: Calculate Activity Rates

LO7-3

Compute activity rates for cost pools.

The activity rates that will be used for assigning overhead costs to products and customers are computed in Exhibit 7-7. The ABC team determined the total activity for each cost pool that would be required to produce the company's present product mix and to serve its present customers. These numbers are listed in Exhibit 7-7. For example, the ABC team found that 400 new product designs are required each year to serve the company's present customers. The activity rates are computed by dividing the *total* cost for each activity by its *total* activity. For example, the $320,000 total annual cost for the Customer Orders cost pool (which was computed in Exhibit 7-6) is divided by the total of 1,000 customer orders per year to arrive at the activity rate of $320 per customer order. Similarly, the $252,000 *total* cost for the Product Design cost pool is divided by the *total* number of designs (i.e., 400 product designs) to determine the activity rate of $630 per design. Note that an activity rate is not computed for the Other category of costs. This is because the *Other* cost pool consists of organization-sustaining costs and costs of idle capacity that are not allocated to products and customers.

The rates in Exhibit 7-7 indicate that *on average* a customer order consumes resources that cost $320; a product design consumes resources that cost $630; a unit of product consumes resources that cost $19 per machine-hour; and maintaining relations with a customer consumes resources that cost $1,470. Note that these are *average* figures. Some members of the ABC design team at Classic Brass argued that it would be unfair to charge all new products the same $630 product design cost regardless of how much design time they actually require. After discussing the pros and cons, the team concluded that it would not be worth the effort at the present time to keep track of actual design time spent on each new product. They felt that the benefits of increased accuracy would not be great enough to justify the higher cost of implementing and maintaining the more detailed costing system. Similarly, some team members were uncomfortable assigning the same $1,470 cost to each customer. Some customers are undemanding—ordering standard products well in advance of their needs. Others are very demanding and consume large amounts of marketing and administrative staff time. These are generally customers who order customized products, who tend to order at the last minute, and who change their minds. While everyone agreed with this observation, the data that would be required to measure individual customers' demands on resources were not currently available. Rather than delay implementation of the ABC system, the team decided to defer such refinements to a later date.

Before proceeding further, it would be helpful to get a better idea of the overall process of assigning costs to products and other cost objects in an ABC system. Exhibit 7-8 provides a visual perspective of the ABC system at Classic Brass. We recommend that you carefully go over this exhibit. In particular, note that the Other category, which contains organization-sustaining costs and costs of idle capacity, is not allocated to products or customers.

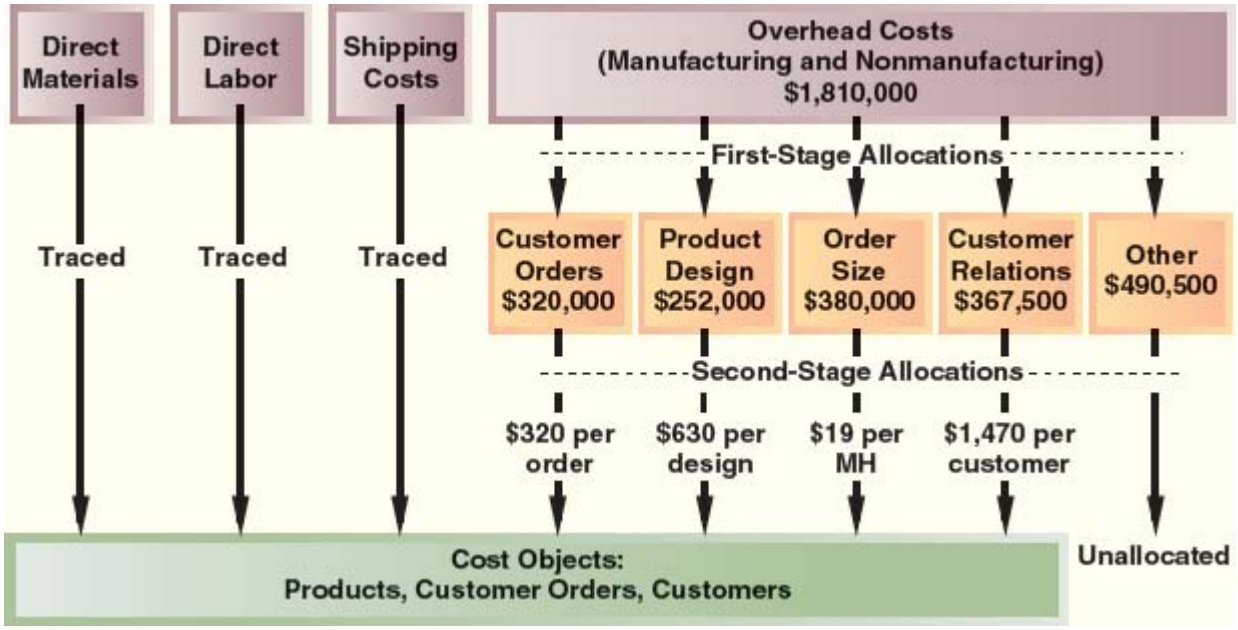
EXHIBIT 7-7

Computation of Activity Rates

	A	B	C	D	E	F	G
1	*Activity Cost Pools*	*(a) Total Cost**	*(b) Total Activity*		*(a) ÷ (b) Activity Rate*		
2	Customer orders	$320,000	1,000	orders	$320	per order	
3	Product design	$252,000	400	designs	$630	per design	
4	Order size	$380,000	20,000	MHs	$19	per MH	
5	Customer relations	$367,500	250	customers	$1,470	per customer	
6	Other	$490,500	Not applicable		Not applicable		
7							
8	*From Exhibit 7-6.						
9							

Exhibit 7-5 | Exhibit 7-6 | Exhibit 7-7 | Exhibit 7-9 | Exhibit 7-10 | Exhibit 7-11 | Exhibit 7-11 (2)

EXHIBIT 7-8
The Activity-Based Costing Model at Classic Brass



Step 4: Assign Overhead Costs to Cost Objects

LO7-4
Assign costs to a cost object using a second-stage allocation.

The fourth step in the implementation of activity-based costing is called *second-stage allocation.* In the **second-stage allocation**, activity rates are used to apply overhead costs to products and customers. First, we will illustrate how to assign costs to products followed by an example of how to assign costs to customers.

The data needed by the ABC team to assign overhead costs to Classic Brass's two products—standard stanchions and custom compass housings—are as follows:

Standard Stanchions

1. This product line does not require any new design resources.
2. 30,000 units were ordered during the year, comprising 600 separate orders.
3. Each stanchion requires 35 minutes of machine time for a total of 17,500 machine-hours.

Custom Compass Housings

1. This is a custom product that requires new design resources.
2. There were 400 orders for custom compass housings. Orders for this product are placed separately from orders for standard stanchions.
3. There were 400 custom designs prepared. One custom design was prepared for each order.
4. Because some orders were for more than one unit, a total of 1,250 custom compass housings were produced during the year. A custom compass housing requires an average of 2 machine-hours for a total of 2,500 machine-hours.

Notice, 600 customer orders were placed for standard stanchions and 400 customer orders were placed for custom compass housings, for a total of 1,000 customer orders. All 400 product designs related to custom compass housings; none related to standard stanchions. Producing 30,000 standard stanchions required 17,500 machine-hours and producing 1,250 custom compass housings required 2,500 machine-hours, for a total of 20,000 machine-hours.

IN BUSINESS

HOW MUCH DOES IT COST TO HANDLE A PIECE OF LUGGAGE?

It costs an airline about $15 to carry a piece of checked luggage from one destination another. The activity "transporting luggage" consists of numerous sub-activities such as tagging bags, sorting them, placing them on carts, transporting bags planeside, loading them into the airplane, and delivering them to carousels and connecting flights.

A variety of employees invest a portion of their labor hours "transporting luggage" including ground personnel, check-in agents, service clerks, baggage service managers, and maintenance workers. In total, labor costs comprise $9 per bag. Airlines also spend millions of dollars on baggage equipment, sorting systems, carts, tractors, and conveyors, as well as rental costs related to bag rooms, carousels, and offices. They also pay to deliver misplaced bags to customers' homes and to compensate customers for lost bags that are never found. These expenses add up to about $4 per bag. The final expense related to transporting luggage is fuel costs, which average about $2 per bag.

Many major airlines now charge fees for checked bags. United Airlines expects to collect $275 million annually for its first and second bag fees.

Source: Scott McCartney, "What It Costs an Airline to Fly Your Luggage," *The Wall Street Journal*, November 25, 2008, p. D1 and D8.

Exhibit 7-9 illustrates how overhead costs are assigned to the standard stanchions and custom compass housings. For example, the exhibit shows that $192,000 of overhead costs are assigned from the Customer Orders activity cost pool to the standard stanchions ($320 per order × 600 orders). Similarly, $128,000 of overhead costs are assigned from the Customer Orders activity cost pool to the custom compass housings ($320 per order × 400 orders). The Customer Orders cost pool contained a total of $320,000 (see Exhibit 7-6 or 7-7) and this total amount has been assigned to the two products ($192,000 + $128,000 = $320,000).

EXHIBIT 7-9

Assigning Overhead Costs to Products

	A	B	C	D	E	F	G
1	**Overhead Cost for the Standard Stanchions**						
2	*Activity Cost Pools*	*(a) Activity Rate**		*(b) Activity*		*(a) × (b) ABC Cost*	
3	Customer orders	$320	per order	600	orders	$ 192,000	
4	Product design	$630	per design	0	designs	0	
5	Order size	$19	per MH	17,500	MHs	332,500	
6	Total					$ 524,500	
7							
8	**Overhead Cost for the Custom Compass Housing**						
9	*Activity Cost Pools*	*(a) Activity Rate**		*(b) Activity*		*(a) × (b) ABC Cost*	
10	Customer orders	$320	per order	400	orders	$ 128,000	
11	Product design	$630	per design	400	designs	252,000	
12	Order size	$19	per MH	2,500	MHs	47,500	
13	Total					$ 427,500	
14							
15	*From Exhibit 7-7.						
16							

Exhibit 7-5 | Exhibit 7-6 | Exhibit 7-7 | **Exhibit 7-9** | Exhibit 7-10 | Exhibit 7-11 | Exl

Exhibit 7-9 shows that a total of $952,000 of overhead costs is assigned to Classic Brass's two product lines—$524,500 to standard stanchions and $427,500 to custom compass housings. This amount is less than the $1,810,000 of overhead costs included in the ABC system. Why? The total amount of overhead assigned to products does not match the total amount of overhead cost in the ABC system because the ABC team purposely did not assign the $367,500 of Customer Relations and $490,500 of Other costs to products. The Customer Relations activity is a customer-level activity and the Other activity is an organization-sustaining activity—neither activity is caused by products. As shown below, when the Customer Relations and Other activity costs are added to the $952,000 of overhead costs assigned to products, the total is $1,810,000.

	Standard Stanchions	Custom Compass Housings	Total
Overhead Costs Assigned to Products			
Customer orders	$192,000	$128,000	$ 320,000
Product design	0	252,000	252,000
Order size	332,500	47,500	380,000
Subtotal	$524,500	$427,500	952,000
Overhead Costs not Assigned to Products			
Customer relations			367,500
Other			490,500
Subtotal			858,000
Total overhead cost			$1,810,000

Next, we describe another example of second-stage allocation—assigning activity costs to customers. The data needed by Classic Brass to assign overhead costs to one of its customers—Windward Yachts—are as follows:

Windward Yachts

1. The company placed a total of three orders.
   a. Two orders were for 150 standard stanchions per order.
   b. One order was for a single custom compass housing unit.
2. A total of 177 machine-hours were used to fulfill the three customer orders.
   a. The 300 standard stanchions required 175 machine-hours.
   b. The custom compass housing required 2 machine-hours.
3. Windward Yachts is one of 250 customers served by Classic Brass.

Exhibit 7-10 illustrates how the ABC system assigns overhead costs to this customer. As shown in Exhibit 7-10, the ABC team calculated that $6,423 of overhead costs should be assigned to Windward Yachts. The exhibit shows that Windward Yachts is assigned $960 ($320 per order × 3

orders) of overhead costs from the Customer Orders activity cost pool; $630 ($630 per design × 1 design) from the Product Design cost pool; $3,363 ($19 per machine-hour × 177 machine-hours) from the Order Siz%cost pool; and $1,470 ($1,470 per custo- er × 1 customer) f2om the Cu3tomer Relations cost pool.

EXHIBIT 7-10
Assigning Overhead Costs to Customers

	A	B	C	D	E	F
1	**Overhead Cost for Windward Yachts**					
2						
3	*Activity Cost Pools*	*(a) Activity Rate**		*(b) Activity*		*(a) × (b) ABC Cost*
4	Customer orders	$320	per order	3	orders	$ 960
5	Product design	$630	per design	1	designs	630
6	Order size	$19	per MH	177	MHs	3,363
7	Customer relations	$1,470	per customer	1	customer	1,470
8	Total overhead cost assigned to customer					$ 6,423
9						
10	*From Exhibit 7-7.					
11						

Exhibit 7-5 | Exhibit 7-6 | Exhibit 7-7 | Exhibit 7-9 | **Exhibit 7-10** | Exhibit 7-11 | Exhibit 7-

With second-stage allocations complete, the ABC design team was ready to turn its attention to creating reports that would help explain the company's first ever net operating loss.

Step 5: Prepare Management Reports

LO7-5
Use activity-based costing to compute product and customer margins.

The most common management reports prepared with ABC data are product and customer profitability reports. These reports help companies channel their resources to their most profitable growth opportunities while at the same time highlighting products and customers that drain profits. We begin by illustrating a product profitability report followed by a customer profitability report.

The Classic Brass ABC team realized that the profit from a product, also called the *product margin,* is a function of the product's sales and the direct and indirect costs that the product causes. The ABC cost allocations shown in Exhibit 7-9 only summarize each product's indirect (i.e., overhead) costs. Therefore, to compute a product's profit (i.e., product margin), the design team needed to gather each product's sales and direct costs in addition to the overhead costs previously computed. The pertinent sales and direct cost data for each product are shown below. Notice the numbers in the total column agree with the income statement in Exhibit 7-2.

	Standard Stanchions	Custom Compass Housings	Total
Sales	$2,660,000	$540,000	$3,200,000
Direct costs:			
Direct materials	$905,500	$69,500	$975,000
Direct labor	$263,750	$87,500	$351,250
Shipping	$60,000	$5,000	$65,000

Having gathered the above data, the design team created the product profitability report shown in Exhibit 7-11. The report revealed that standard stanchions are profitable, with a positive product margin of $906,250, whereas the custom compass housings are unprofitable, with a negative product margin of $49,500. Keep in mind that the product profitability report purposely does not include the costs in the Customer Relations and Other activity cost pools. These costs, which total $858,000, were excluded from the report because they are not caused by the products. Customer Relations costs are caused by customers, not products. The Other costs are organization-sustaining costs and unused capacity costs that are not caused by any particular product.

EXHIBIT 7-11

Product Margins—Activity-Based Costing

	A	B	C	D	E	F
1	**Product Margins—Activity-Based Costing**					
2		*Standard Stanchions*			*Custom Compass Housings*	
3	Sales		$ 2,660,000			$ 540,000
4	Costs:					
5	Direct materials	$ 905,500			$ 69,500	
6	Direct labor	263,750			87,500	
7	Shipping	60,000			5,000	
8	Customer orders (from Exhibit 7-9)	192,000			128,000	
9	Product design (from Exhibit 7-9)	-			252,000	
10	Order size (from Exhibit 7-9)	332,500			47,500	
11	Total cost		1,753,750			589,500
12	Product margin		$ 906,250			$ (49,500)
13						

Exhibit 7-5 | Exhibit 7-6 | Exhibit 7-7 | Exhibit 7-9 | Exhibit 7-10 | **Exhibit 7-11** | Exhib

The product margins can be reconciled with the company's net operating loss as follows:

	Standard Stanchions	Custom Compass Housings	Total
Sales (See Exhibit 7–11)	$2,660,000	$540,000	$3,200,000
Total costs (See Exhibit 7–11)	1,753,750	589,500	2,343,250
Product margins (See Exhibit 7–11)	$ 906,250	$ (49,500)	856,750
Overhead costs not assigned to products:			
Customer relations			367,500
Other			490,500
Total			858,000
Net operating loss			$ (1,250)

Next, the design team created a customer profitability report for Windward Yachts. Similar to the product profitability report, the design team needed to gather data concerning sales to Windward Yachts and the direct material, direct labor, and shipping costs associated with those sales. Those data are presented below:

	Windward Yachts
Sales	$11,350
Direct costs:	
Direct material costs	$2,123
Direct labor costs	$1,900
Shipping costs	$205

IN BUSINESS

IS ACTIVITY-BASED COSTING STILL BEING USED?

Researchers surveyed 348 managers to determine which costing methods their companies use. The table below shows the percentage of respondents whose companies use the various costing methods to assign departmental costs to cost objects such as products.

	Departments						
Costing Method	Research and Development	Product and Process Design	Production	Sales and Marketing	Distribution	Customer Service	Shared Services
Activity-based	13.0%	14.7%	18.3%	17.3%	17.2%	21.8%	23.0%
Standard[1]	17.6%	20.7%	42.0%	18.1%	28.4%	18.5%	23.0%
Normal[2]	4.6%	8.6%	9.9%	7.9%	6.0%	8.1%	5.6%
Actual[3]	23.1%	25.0%	23.7%	23.6%	26.7%	16.9%	15.9%
Other	1.9%	0.9%	0.0%	0.8%	0.9%	1.6%	2.4%
Not allocated	39.8%	30.2%	6.1%	32.3%	20.7%	33.1%	30.2%

[1]Standard costing is used for the variance computations in Chapter 10.
[2]Normal costing is used for the job-order costing computations in Chapter 3.
[3]Actual costing is used to create the absorption and variable costing income statements in Chapter 6.

The results show that 18.3% of respondents use ABC to allocate production costs to cost objects and 42% use standard costing for the same purpose. ABC is used by at least 13% of respondents within all functional departments across the value chain. Many companies do not allocate nonproduction costs to cost objects.

Source: William O. Stratton, Denis Desroches, Raef Lawson, and Toby Hatch, "Activity-Based Costing: Is It Still Relevant?" *Management Accounting Quarterly*, Spring 2009, pp. 31–40.

Using these data and the data from Exhibit 7-10, the design team created the customer profitability report shown in Exhibit 7-12. The report revealed that the customer margin for Windward Yachts is $699. A similar report could be prepared for each of Classic Brass's 250 customers, thereby enabling the company to cultivate relationships with its most profitable customers, while taking steps to reduce the negative impact of unprofitable customers.

EXHIBIT 7-12
Customer Margin—Activity-Based Costing

	A	B	C
1	**Customer Margin—Activity-Based Costing**		
2		*Windward Yachts*	
3	Sales		$11,350
4	Costs:		
5	Direct materials	$ 2,123	
6	Direct labor	1,900	
7	Shipping	205	
8	Customer orders (from Exhibit 7-10)	960	
9	Product design (from Exhibit 7-10)	630	
10	Order size (from Exhibit 7-10)	3,363	
11	Customer relations (from Exhibit 7-10)	1,470	10,651
12	Customer margin		$ 699
13			

Exhibit 7-12 | Exhibit 7-13 | Exhibit 7-14 | Exhibit 7A-1 | Ex

Comparison of Traditional and ABC Product Costs

The ABC team used a two-step process to compare its traditional and ABC product costs. First, the team reviewed the product margins reported by the traditional cost system. Then, it contrasted the differences between the traditional and ABC product margins.

Product Margins Computed Using the Traditional Cost System

Classic Brass's traditional cost system assigns only manufacturing costs to products—this includes direct materials, direct labor, and manufacturing overhead. Selling and administrative costs are not assigned to products. Exhibit 7-13 shows the product margins reported by Classic Brass's traditional cost system. We will explain how these margins were calculated in three steps. First, the sales and direct materials and direct labor cost data are the same numbers used by the ABC team to prepare Exhibit 7-11. In other words, the traditional cost system and the ABC system treat these three pieces of revenue and cost data identically.

Second, the traditional cost system uses a plantwide overhead rate to assign manufacturing overhead costs to products. The numerator for the plantwide overhead rate is $1,000,000, which is the total amount of manufacturing overhead shown on the income statement in Exhibit 7-2. The footnote in Exhibit 7-2 mentions that the traditional cost system uses machine-hours to assign manufacturing overhead costs to products. The Order Size activity in Exhibit 7-7 used 20,000 machine-hours as its level of activity. These same 20,000 machine-hours would be used in the denominator of the plantwide overhead rate, which is computed as follows:

$$\text{Plantwide overhead rate} = \frac{\text{Total estimated manufacturing overhead}}{\text{Total estimated machine-hours}}$$

$$= \frac{\$1{,}000{,}000}{20{,}000 \text{ machine-hours}}$$

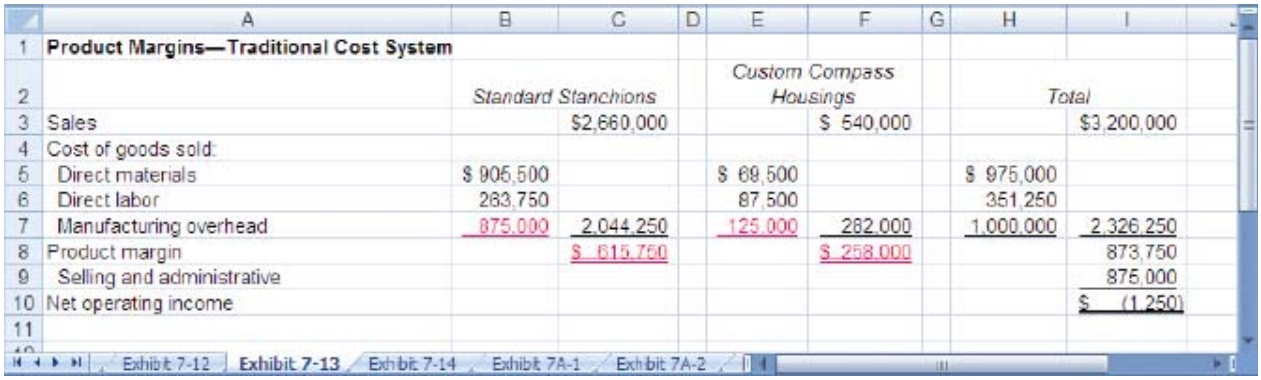
$$= \$50 \text{ per machine-hour}$$

Because 17,500 machine-hours were worked on standard stanchions, this product line is assigned $875,000 (17,500 machine-hours × $50 per machine-hour) of manufacturing overhead cost. Similarly, the custom compass housings required 2,500 machine-hours, so this product line is assigned $125,000 (2,500 machine-hours × $50 per machine-hour) of manufacturing overhead cost. The sales of each product minus its cost of goods sold equals the product margin of $615,750 for standard stanchions and $258,000 for custom compass housings.

Notice, the net operating loss of $1,250 shown in Exhibit 7-13 agrees with the loss reported in the income statement in Exhibit 7-2 and with the loss shown in the table beneath Exhibit 7-11. The company's *total* sales, *total* costs, and its resulting net operating loss are the same regardless of whether you are looking at the absorption income statement in Exhibit 7-2, the ABC product profitability analysis depicted on page 304, or the traditional product profitability analysis in Exhibit 7-13. Although the "total pie" remains constant across the traditional and ABC systems, what differs is how the pie is divided between the two product lines. The traditional product margin calculations

suggest that standard stanchions are generating a product margin of $615,750 and the custom compass housings a product margin of $258,000. However, these product margins differ from the ABC product margins reported in Exhibit 7-11. Indeed, the traditional cost system is sending misleading signals to Classic Brass's managers about each product's profitability. Let's explain why.

EXHIBIT 7-13
Product Margins—Traditional Costing System



	A	B	C	D	E	F	G	H	I
1	**Product Margins—Traditional Cost System**								
2		*Standard Stanchions*			*Custom Compass Housings*			*Total*	
3	Sales		$2,660,000			$ 540,000			$3,200,000
4	Cost of goods sold:								
5	Direct materials	$ 905,500			$ 69,500			$ 975,000	
6	Direct labor	263,750			87,500			351,250	
7	Manufacturing overhead	875,000	2,044,250		125,000	282,000		1,000,000	2,326,250
8	Product margin		$ 615,750			$ 258,000			873,750
9	Selling and administrative								875,000
10	Net operating income								$ (1,250)
11									

Exhibit 7-12 | Exhibit 7-13 | Exhibit 7-14 | Exhibit 7A-1 | Exhibit 7A-2

The Differences between ABC and Traditional Product Costs

The changes in product margins caused by switching from the traditional cost system to the activity-based costing system are shown below:

	Standard Stanchions	Custom Compass Housings
Product margins—traditional	$615,750	$ 258,000
Product margins—ABC	906,250	(49,500)
Change in reported product margins	$290,500	$(307,500)

The traditional cost system overcosts the standard stanchions and consequently reports an artificially low product margin for this product. The switch to an activity-based view of product profitability increases the product margin on standard stanchions by $290,500. In contrast, the traditional cost system undercosts the custom compass housings and reports an artificially high product margin for this product. The switch to activity-based costing decreases the product margin on custom compass housings by $307,500.

The reasons for the change in reported product margins between the two costing methods are revealed in Exhibit 7-14. The top portion of the exhibit shows each product's direct and indirect cost assignments as reported by the traditional cost system in Exhibit 7-13. For example, Exhibit 7-14 includes the following costs for standard stanchions: direct materials, $905,500; direct labor, $263,750; and manufacturing overhead, $875,000. Each of these costs corresponds with those reported in Exhibit 7-13. Notice, the selling and administrative costs of $875,000 are purposely not allocated to products because these costs are considered to be period costs when using traditional costing. Similarly, the bottom portion of Exhibit 7-14 summarizes the direct and indirect cost assignments as reported by the activity-based costing system in Exhibit 7-11. The only new information in Exhibit 7-14 is shown in the two columns of percentages. The first column of

percentages shows the percentage of each cost assigned to standard stanchions. For example, the $905,500 of direct materials cost traced to standard stanchions is 92.9% of the company's total direct materials cost of $975,000. The second column of percentages does the same thing for custom compass housings.

EXHIBIT 7-14
A Comparison of Traditional and Activity-Based Cost Assignments

	Standard Stanchions		Custom Compass Housings		
Traditional Cost System	(a) Amount	(a) ÷ (c) %	(b) Amount	(b) ÷ (c) %	(c) Total
Direct materials	$ 905,500	92.9%	$ 69,500	7.1%	$ 975,000
Direct labor	263,750	75.1%	87,500	24.9%	351,250
Manufacturing overhead	875,000	87.5%	125,000	12.5%	1,000,000
Total cost assigned to products	$2,044,250		$282,000		2,326,250
Selling and administrative					875,000
Total cost					$3,201,250
Activity-Based Costing System					
Direct costs:					
Direct materials	$ 905,500	92.9%	$ 69,500	7.1%	$ 975,000
Direct labor	263,750	75.1%	87,500	24.9%	351,250
Shipping	60,000	92.3%	5,000	7.7%	65,000
Indirect costs:					
Customer orders	192,000	60.0%	128,000	40.0%	320,000
Product design	0	0.0%	252,000	100.0%	252,000
Order size	332,500	87.5%	47,500	12.5%	380,000
Total cost assigned to products	$1,753,750		$589,500		2,343,250
Costs not assigned to products:					
Customer relations					367,500
Other					490,500
Total cost					$3,201,250

There are three reasons why the traditional and activity-based costing systems report different product margins. First, Classic Brass's traditional cost system allocates all manufacturing overhead costs to products. This forces both products to absorb all manufacturing overhead costs regardless of whether they actually consumed the costs that were allocated to them. The ABC system does not assign the manufacturing overhead costs consumed by the Customer Relations activity to products because these costs are caused by customers, not specific products. It also does not assign the manufacturing overhead costs included in the Other activity to products because these organization-sustaining and unused capacity costs are not caused by any particular product. From an ABC point of view, assigning these costs to products is inherently arbitrary and counterproductive.

Second, Classic Brass's traditional cost system allocates all of the manufacturing overhead costs using a volume-related allocation base—machine-hours—that may or may not reflect what actually causes the costs. In other words, in the traditional system, 87.5% of each manufacturing overhead cost is implicitly assigned to standard stanchions and 12.5% is assigned to custom compass housings. For example, the traditional cost system inappropriately assigns 87.5% of the costs of the Customer

Orders activity (a batch-level activity) to standard stanchions even though the ABC system revealed that standard stanchions caused only 60% of these costs. Conversely, the traditional cost system assigns only 12.5% of these costs to custom compass housings even though this

product caused 40% of these costs. Similarly, the traditional cost system assigns 87.5% of the costs of the Product Design activity (a product-level activity) to standard stanchions even though the standard stanchions caused none (0%) of these costs. All (100%) of the costs of the Product Design activity, rather than just 12.5%, should be assigned to custom compass housings. The result is that traditional cost systems overcost high-volume products (such as the standard stanchions) and undercost low-volume products (such as the custom compass housings) because they assign batch-level and product-level costs using volume-related allocation bases.

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The third reason the product margins differ between the two cost systems is that the ABC system assigns the nonmanufacturing overhead costs caused by products to those products on a cause-and-effect basis. The traditional cost system disregards these costs because they are classified as period costs. The ABC system directly traces shipping costs to products and includes the nonmanufacturing overhead costs caused by products in the activity cost pools that are assigned to products.

The ABC design team presented the results of its work in a meeting attended by all of the top managers of Classic Brass, including the president John Towers, the production manager Susan Richter, the marketing manager Tom Olafson, and the accounting manager Mary Goodman. The ABC team brought with them copies of the chart showing the ABC design (Exhibit 7-8), and the table comparing the traditional and ABC cost assignments (Exhibit 7-14). After the formal presentation by the ABC team, the following discussion took place:

John: I would like to personally thank the ABC team for all of the work they have done and for an extremely interesting presentation. I am now beginning to wonder about a lot of the decisions we have made in the past using our old cost accounting system. According to the ABC analysis, we had it all backwards. We are losing money on the custom products and making a fistful on the standard products.

Mary: I have to admit that I had no idea that the Product Design work for custom compass housings was so expensive! I knew burying these costs in our plantwide overhead rate was penalizing standard stanchions, but I didn't understand the magnitude of the problem.

Susan: I never did believe we were making a lot of money on the custom jobs. You ought to see all of the problems they create for us in production.

Tom: I hate to admit it, but the custom jobs always seem to give us headaches in marketing, too.

John: If we are losing money on custom compass housings, why not suggest to our customers that they go elsewhere for that kind of work?

Tom: Wait a minute, we would lose a lot of sales.

Susan: So what, we would save a lot more costs.

Mary: Maybe yes, maybe no. Some of the costs would not disappear if we were to drop the custom business.

Tom: Like what?

Mary: Well Tom, I believe you said that about 10% of your time is spent dealing with new products. As a consequence, 10% of your salary was allocated to the Product Design cost pool. If we were to drop all of the products requiring design work, would you be willing to take a 10% pay cut?

Tom: I trust you're joking.

Mary: Do you see the problem? Just because 10% of your time is spent on custom products doesn't mean that the company would save 10% of your salary if the custom products were dropped. Before we take a drastic action like dropping the custom products, we should identify which costs are really relevant.

John: I think I see what you are driving at. We wouldn't want to drop a lot of products only to find that our costs really haven't changed much. It is true that dropping the products would free up resources like Tom's time, but we had better be sure we have some good use for those resources *before* we take such an action.

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As this discussion among the managers of Classic Brass illustrates, caution should be exercised before taking action based on an ABC analysis such as the one shown in Exhibits 7-11 and 7-12. The product and customer margins computed in these exhibits are a useful starting point for further analysis, but managers need to know what costs are really affected before taking any action such as dropping a product or customer or changing the prices of products or services. Appendix 7A shows how an *action analysis report* can be constructed to help managers make such decisions. An **action analysis report** provides more detail about costs and how they might adjust to changes in activity than the ABC analysis presented in Exhibits 7-11 and 7-12.

IN BUSINESS

AN ABC IMPLEMENTATION IN THAILAND

APS, a parawood furniture factory located in the Songkhla Province of Southern Thailand, employs over 250 workers to make more than 100 types of furniture. The company's traditional cost system assigns indirect manufacturing costs to products based on each product's total sales. Its ABC system relies on various volume-related and non-volume-related activity measures, such as direct labor-hours, number of setups, and number of trips, to assign overhead costs to products.

The company's traditional and ABC systems assigned per-unit overhead costs to its five bestselling products as follows:

	Tile Top Table	Side Chair	Telephone Table	Plant Tree with Grooves	Computer Desk
Traditional cost system allocations	$7.08	$2.21	$3.53	$3.65	$4.53
ABC allocations	2.18	1.13	1.32	1.80	6.07
Difference	$4.90	$1.08	$2.21	$1.85	$(1.54)

Given that all five of these products have high sales volumes, it is not surprising to see that the traditional cost system has overcosted four of them.

Source: Sakesun Suthummanon, Wanida Ratanamanee, Nirachara Boonyanuwat, and Pieanpon Saritprit, "Applying Activity-Based Costing (ABC) to a Parawood Furniture Factory," *The Engineering Economist,* Volume 56 (2011), pp. 80–93.

Targeting Process Improvements

Activity-based costing can also be used to identify activities that would benefit from process improvements. When used in this way, activity-based costing is often called *activity-based management.* Basically, **activity-based management** involves focusing on activities to eliminate waste, decrease processing time, and reduce defects. Activity-based management is used in organizations as diverse as manufacturing companies, hospitals, and the **U.S. Marine Corps**.

The first step in any improvement program is to decide what to improve. The activity rates computed in activity-based costing can provide valuable clues concerning where there is waste and

opportunity for improvement. For example, looking at the activity rates in Exhibit 7-7, managers at Classic Brass may conclude that $320 to process a customer order is far too expensive for an activity that adds no value to the product. As a consequence, they may target their process improvement efforts toward the Customer Orders activity.[3]

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Benchmarking is another way to leverage the information in activity rates. **Benchmarking** is a systematic approach to identifying the activities with the greatest room for improvement. It is based on comparing the performance in an organization with the performance of other, similar organizations known for their outstanding performance. If a particular part of the organization performs far below the world-class standard, managers will be likely to target that area for improvement.

Activity-Based Costing and External Reports

Although activity-based costing generally provides more accurate product costs than traditional costing methods, it is infrequently used for external reports for a number of reasons. First, external reports are less detailed than internal reports prepared for decision making. On the external reports, individual product costs are not reported. Cost of goods sold and inventory valuations are disclosed, but they are not broken down by product. If some products are undercosted and some are overcosted, the errors tend to offset each other when the product costs are added together.

Second, it is often very difficult to make changes in a company's accounting system. The official cost accounting systems in most large companies are usually embedded in complex computer programs that have been modified in-house over the course of many years. It is extremely difficult to make changes in such computer programs without causing numerous bugs.

Third, an ABC system such as the one described in this chapter does not conform to generally accepted accounting principles (GAAP). As discussed in prior chapters, product costs computed for external reports must include all of the manufacturing costs and only manufacturing costs; but in an ABC system as described in this chapter, product costs exclude some manufacturing costs and include some nonmanufacturing costs. It is possible to adjust the ABC data at the end of the period to conform to GAAP, but that requires more work.

Fourth, auditors are likely to be uncomfortable with allocations that are based on interviews with the company's personnel. Such subjective data can be easily manipulated by management to make earnings and other key variables look more favorable.

For all of these reasons, most companies confine their ABC efforts to special studies for management, and they do not attempt to integrate activity-based costing into their formal cost accounting systems.

The Limitations of Activity-Based Costing

Implementing an activity-based costing system is a major project that requires substantial resources. And once implemented, an activity-based costing system is more costly to maintain than a traditional costing system—data concerning numerous activity measures must be periodically collected, checked, and entered into the system. The benefits of increased accuracy may not outweigh these costs.

Activity-based costing produces numbers, such as product margins, that are at odds with the numbers produced by traditional costing systems. But managers are accustomed to using traditional costing systems to run their operations and traditional costing systems are often used in performance evaluations. Essentially, activity-based costing changes the rules of the game. It is a fact of human nature that changes in organizations, particularly those that alter the rules of the game, inevitably face resistance. This underscores the importance of top management support and the full participation of line managers, as well as the accounting staff, in any activity-based costing initiative. If activity-based costing is viewed as an accounting initiative that does not have the full support of top management, it is doomed to failure.

In practice, most managers insist on fully allocating all costs to products, customers, and other costing objects in an activity-based costing system—including the costs of idle capacity and organization-sustaining costs. This results in overstated costs and understated margins and mistakes in pricing and other critical decisions.

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Activity-based costing data can easily be misinterpreted and must be used with care when used in making decisions. Costs assigned to products, customers, and other cost objects are only *potentially* relevant. Before making any significant decisions using activity-based costing data, managers must identify which costs are really relevant for the decision at hand. See Appendix 7A for more details.

As discussed in the previous section, reports generated by the best activity-based costing systems do not conform to external reporting requirements. Consequently, an organization involved in activity-based costing should have two cost systems—one for internal use and one for preparing external reports. This is costlier than maintaining just one system and may cause confusion about which system is to be believed and relied on.

Summary

Traditional cost accounting methods suffer from several defects that can result in distorted costs for decision-making purposes. All manufacturing costs—even those that are not caused by any specific product—are allocated to products. Nonmanufacturing costs that are caused by products are not assigned to products. And finally, traditional methods tend to place too much reliance on unit-level allocation bases such as direct labor and machine-hours. This results in overcosting high-volume products and undercosting low-volume products and can lead to mistakes when making decisions.

Activity-based costing estimates the costs of the resources consumed by cost objects such as products and customers. The activity-based costing approach assumes that cost objects generate activities that in turn consume costly resources. Activities form the link between costs and cost objects. Activity-based costing is concerned with overhead—both manufacturing overhead and selling and administrative overhead. The accounting for direct labor and direct materials is usually the same under traditional and ABC costing methods.

To build an ABC system, companies typically choose a small set of activities that summarize much of the work performed in overhead departments. Associated with each activity is an activity cost pool. To the extent possible, overhead costs are directly traced to these activity cost pools. The remaining overhead costs are allocated to the activity cost pools in the first-stage allocation. Interviews with managers often form the basis for these allocations.

An activity rate is computed for each cost pool by dividing the costs assigned to the cost pool by the measure of activity for the cost pool. Activity rates provide useful information to managers concerning the costs of performing overhead activities. A particularly high cost for an activity may trigger efforts to improve the way the activity is carried out in the organization.

In the second-stage allocation, activity rates are used to apply costs to cost objects such as products and customers. The costs computed under activity-based costing are often quite different from the costs generated by a company's traditional cost accounting system. While the ABC system is almost certainly more accurate, managers should nevertheless exercise caution before making decisions based on the ABC data. Some of the costs may not be avoidable and hence would not be relevant.

Review Problem: Activity-Based Costing

Ferris Corporation makes a single product—a fire-resistant commercial filing cabinet—that it sells to office furniture distributors. The company has a simple ABC system that it uses for internal decision making. The company has two overhead departments whose costs are listed on the following page:

Manufacturing overhead	$500,000
Selling and administrative overhead	300,000
Total overhead costs	$800,000

The company's ABC system has the following activity cost pools and activity measures:

Activity Cost Pool	Activity Measure
Assembling units	Number of units
Processing orders	Number of orders
Supporting customers	Number of customers
Other	Not applicable

Costs assigned to the "Other" activity cost pool have no activity measure; they consist of the costs of unused capacity and organization-sustaining costs—neither of which are assigned to orders, customers, or the product.

Ferris Corporation distributes the costs of manufacturing overhead and selling and administrative overhead to the activity cost pools based on employee interviews, the results of which are reported below:

Distribution of Resource Consumption Across Activity Cost Pools

	Assembling Units	Processing Orders	Supporting Customers	Other	Total
Manufacturing overhead	50%	35%	5%	10%	100%
Selling and administrative overhead	10%	45%	25%	20%	100%
Total activity	1,000 units	250 orders	100 customers		

Required:

1. Perform the first-stage allocation of overhead costs to the activity cost pools as in Exhibit 7-6.
2. Compute activity rates for the activity cost pools as in Exhibit 7-7.
3. OfficeMart is one of Ferris Corporation's customers. Last year, OfficeMart ordered filing cabinets four different times. OfficeMart ordered a total of 80 filing cabinets during the year. Construct a table as in Exhibit 7-10 showing the overhead costs attributable to OfficeMart.
4. The selling price of a filing cabinet is $595. The cost of direct materials is $180 per filing cabinet, and direct labor is $50 per filing cabinet. What is the customer margin of OfficeMart? See Exhibit 7-12 for an example of how to complete this report.

Solution to Review Problem

1. The first-stage allocation of costs to the activity cost pools appears below:

	Activity Cost Pools				
	Assembling Units	Processing Orders	Supporting Customers	Other	Total
Manufacturing overhead . . .	$250,000	$175,000	$ 25,000	$ 50,000	$500,000
Selling and administrative overhead	30,000	135,000	75,000	60,000	300,000
Total cost	$280,000	$310,000	$100,000	$110,000	$800,000

2. The activity rates for the activity cost pools are:

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Activity Cost Pools	(a) Total Cost	(b) Total Activity	(a) ÷ (b) Activity Rate
Assembling units	$280,000	1,000 units	$280 per unit
Processing orders	$310,000	250 orders	$1,240 per order
Supporting customers	$100,000	100 customers	$1,000 per customer

3. The overhead cost attributable to OfficeMart would be computed as follows:

Activity Cost Pools	(a) Activity Rate	(b) Activity	(a) × (b) ABC Cost
Assembling units	$280 per unit	80 units	$22,400
Processing orders	$1,240 per order	4 orders	$4,960
Supporting customers	$1,000 per customer	1 customer	$1,000

4. The customer margin can be computed as follows:

Sales ($595 per unit × 80 units)		$47,600
Costs:		
Direct materials ($180 per unit × 80 units)	$14,400	
Direct labor ($50 per unit × 80 units)	4,000	
Assembling units (above)	22,400	
Processing orders (above)	4,960	
Supporting customers (above)	1,000	46,760
Customer margin		$ 840

Glossary

Action analysis report A report showing what costs have been assigned to a cost object, such as a product or customer, and how difficult it would be to adjust the cost if there is a change in activity. (p. 310)

Activity An event that causes the consumption of overhead resources in an organization. (p. 290)

Activity-based costing (ABC) A costing method based on activities that is designed to provide managers with cost information for strategic and other decisions that potentially affect capacity and therefore fixed as well as variable costs. (p. 287)

Activity-based management (ABM) A management approach that focuses on managing activities as a way of eliminating waste and reducing delays and defects. (p. 310)

Activity cost pool A "bucket" in which costs are accumulated that relate to a single activity measure in an activity-based costing system. (p. 290)

Activity measure An allocation base in an activity-based costing system; ideally, a measure of the amount of activity that drives the costs in an activity cost pool. (p. 290)

Batch-level activities Activities that are performed each time a batch of goods is handled or processed, regardless of how many units are in the batch. The amount of resource consumed depends on the number of batches run rather than on the number of units in the batch. (p. 290)

Benchmarking A systematic approach to identifying the activities with the greatest potential for improvement. (p. 311)

Customer-level activities Activities that are carried out to support customers, but that are not related to any specific product. (p. 291)

Duration driver A measure of the amount of time required to perform an activity. (p. 290)

First-stage allocation The process by which overhead costs are assigned to activity cost pools in an activity-based costing system. (p. 296)

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Organization-sustaining activities Activities that are carried out regardless of which customers are served, which products are produced, how many batches are run, or how many units are made. (p. 291)

Product-level activities Activities that relate to specific products that must be carried out regardless of how many units are produced and sold or batches run. (p. 291)

Second-stage allocation The process by which activity rates are used to apply costs to products and customers in activity-based costing. (p. 300)

Transaction driver A simple count of the number of times an activity occurs. (p. 290)

Unit-level activities Activities that are performed each time a unit is produced. (p. 290)

Questions

7-1 In what fundamental ways does activity-based costing differ from traditional costing methods such as job-order costing as described in Chapter 3?

7-2 Why is direct labor a poor base for allocating overhead in many companies?

7-3 Why are top management support and cross-functional involvement crucial when attempting to implement an activity-based costing system?

7-4 What are unit-level, batch-level, product-level, customer-level, and organization-sustaining activities?

7-5 What types of costs should not be assigned to products in an activity-based costing system?

7-6 Why are there two stages of allocation in activity-based costing?

7-7 Why is the first stage of the allocation process in activity-based costing often based on interviews?

7-8 When activity-based costing is used, why do manufacturing overhead costs often shift from high-volume products to low-volume products?

7-9 How can the activity rates (i.e., cost per activity) for the various activities be used to target process improvements?

7-10 Why is the activity-based costing described in this chapter unacceptable for external financial reports?

Multiple-choice questions are provided on the text website at **www.mhhe.com/garrison15e**.

Applying Excel

Available with McGraw-Hill's *Connect*® *Accounting*.

LO7-1, LO7-2, LO7-3, LO7-4

The Excel worksheet form that appears on the next page is to be used to recreate the Review Problem on pages 312–314. Download the workbook containing this form from the Online Learning Center at **www.mhhe.com/garrison15e**. *On the website you will also receive instructions about how to use this worksheet form.*

You should proceed to the requirements below only after completing your worksheet.

Required:

1. Check your worksheet by doubling the units ordered in cell B16 to 160. The customer margin under activity-based costing should now be $7,640 and the traditional costing product margin should be $(21,600). If you do not get these results, find the errors in your worksheet and correct them.
    a. Why has the customer margin under activity-based costing more than doubled when the number of units ordered is doubled?
    b. Why has the traditional costing product margin exactly doubled from a loss of $10,800 to a loss of $21,600?
    c. Which costing system, activity-based costing or traditional costing, provides a more accurate picture of what happens to profits as the number of units ordered increases? Explain.

	A	B	C	D	E	F	G
1	Chapter 7: Applying Excel						
2							
3	Data						
4	Manufacturing overhead	$500,000					
5	Selling and administrative overhead	$300,000					
6							
7		*Assembling Units*	*Processing Orders*	*Supporting Customers*	*Other*		
8	Manufacturing overhead	50%	35%	5%	10%		
9	Selling and administrative overhead	10%	45%	25%	20%		
10	Total activity	1,000	250	100			
11		units	orders	customers			
12							
13	OfficeMart orders:						
14	Customers	1	customer				
15	Orders	4	orders				
16	Number of filing cabinets ordered in total	80	units				
17	Selling price	$595					
18	Direct materials	$180					
19	Direct labor	$50					
20							
21	*Enter a formula into each of the cells marked with a ? below*						
22	**Review Problem: Activity-Based Costing**						
23							
24	***Perform the first stage allocations***						
25		*Assembling Units*	*Processing Orders*	*Supporting Customers*	*Other*	*Total*	
26	Manufacturing overhead	?	?	?	?	?	
27	Selling and administrative overhead	?	?	?	?	?	
28	Total cost	?	?	?	?	?	
29							
30	***Compute the activity rates***						
31	*Activity Cost Pools*	*Total Cost*	*Total Activity*		*Activity Rate*		
32	Assembling units	?	? units		? per unit		
33	Processing orders	?	? orders		? per order		
34	Supporting customers	?	? customers		? per customer		
35							
36	***Compute the overhead cost attributable to the OfficeMart orders***						
37	*Activity Cost Pools*	*Activity Rate*		*Activity*		*ABC Cost*	
38	Assembling units	?	per unit	?	units	?	
39	Processing orders	?	per order	?	orders	?	
40	Supporting customers	?	per customer	?	customer	?	
41							
42	***Determine the customer margin for the OfficeMart orders under Activity-Based Costing***						
43	Sales		?				
44	Costs:						
45	Direct materials	?					
46	Direct labor	?					
47	Unit-related overhead	?					
48	Order-related overhead	?					
49	Customer-related overhead	?	?				
50	Customer margin		?				
51							
52	***Determine the product margin for the OfficeMart orders under a traditional cost system***						
53	Manufacturing overhead	?					
54	Total activity	?	units				
55	Manufacturing overhead per unit	?	per unit				
56							
57	Sales		?				
58	Costs:						
59	Direct materials	?					
60	Direct labor	?					
61	Manufacturing overhead	?	?				
62	Traditional costing product margin		?				
63							

Chapter 7 Form | Filled in Chapter 7 Form | Chapter 7 Formulas

2. Let's assume that OfficeMart places different orders next year, purchasing higher-end filing cabinets more frequently, but in smaller quantities per order. Enter the following data into your worksheet:

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Data				
Manufacturing overhead	$500,000			
Selling and administrative overhead	$300,000			
	Assembling Units	Processing Orders	Supporting Customers	Other
Manufacturing overhead	50%	35%	5%	10%
Selling and administrative overhead	10%	45%	25%	20%
Total activity	1,000 units	250 orders	100 customers	
OfficeMart orders:				
Customers	1 customer			
Orders	20 orders			
Total number of filing cabinets ordered	80 units			
Selling price	$795			
Direct materials	$185			
Direct labor	$90			

   a. What is the customer margin under activity-based costing?
   b. What is the product margin under the traditional cost system?
   c. Explain why the profitability picture looks much different now than it did when OfficeMart was ordering less expensive filing cabinets less frequently, but in larger quantities per order.

3. Using the data you entered in part (2), change the percentage of selling and administrative overhead attributable to processing orders from 45% to 30% and the percentage attributable to supporting customers from 25% to 40%. That portion of the worksheet should look like this:

	Assembling Units	Processing Orders	Supporting Customers	Other
Manufacturing overhead	50%	35%	5%	10%
Selling and administrative overhead	10%	30%	40%	20%
Total activity	1,000 units	250 orders	100 customers	

   a. Relative to the results from part (2), what has happened to the customer margin under activity-based costing? Why?
   b. Relative to the results from part (2), what has happened to the product margin under the traditional cost system? Why?

The Foundational 15

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LO7-1, LO7-3, LO7-4

Hickory Company manufactures two products—14,000 units of Product Y and 6,000 units of Product Z. The company uses a plantwide overhead rate based on direct labor-hours. It is considering implementing an activity-based costing (ABC) system that allocates all of its manufacturing overhead to four cost pools. The following additional information is available for the company as a whole and for Products Y and Z:

Activity Cost Pool	Activity Measure	Estimated Overhead Cost	Expected Activity
Machining	Machine-hours	$200,000	10,000 MHs
Machine setups	Number of setups	$100,000	200 setups
Product design	Number of products	$84,000	2 products
General factory	Direct labor-hours	$300,000	12,000 DLHs

Activity Measure	Product Y	Product Z
Machine-hours	7,000	3,000
Number of setups	50	150
Number of products	1	1
Direct labor-hours	8,000	4,000

Required:

1. What is the company's plantwide overhead rate?
2. Using the plantwide overhead rate, how much manufacturing overhead cost is allocated to Product Y? How much is allocated to Product Z?
3. What is the activity rate for the Machining activity cost pool?
4. What is the activity rate for the Machine Setups activity cost pool?
5. What is the activity rate for the Product Design activity cost pool?
6. What is the activity rate for the General Factory activity cost pool?
7. Which of the four activities is a batch-level activity? Why?
8. Which of the four activities is a product-level activity? Why?
9. Using the ABC system, how much total manufacturing overhead cost would be assigned to Product Y?
10. Using the ABC system, how much total manufacturing overhead cost would be assigned to Product Z?
11. Using the plantwide overhead rate, what percentage of the total overhead cost is allocated to Product Y? What percentage is allocated to Product Z?
12. Using the ABC system, what percentage of the Machining costs is assigned to Product Y? What percentage is assigned to Product Z? Are these percentages similar to those obtained in requirement 11? Why?
13. Using the ABC system, what percentage of Machine Setups cost is assigned to Product Y? What percentage is assigned to Product Z? Are these percentages similar to those obtained in requirement 11? Why?
14. Using the ABC system, what percentage of the Product Design cost is assigned to Product Y? What percentage is assigned to Product Z? Are these percentages similar to those obtained in requirement 11? Why?
15. Using the ABC system, what percentage of the General Factory cost is assigned to Product Y? What percentage is assigned to Product Z? Are these percentages similar to those obtained in requirement 11? Why?

Exercises

All applicable exercises are available with McGraw-Hill's *Connect® Accounting.*

EXERCISE 7-1 ABC Cost Hierarchy [LO7-1]

The following activities occur at Greenwich Corporation, a company that manufactures a variety of products.

a. Receive raw materials from suppliers.
b. Manage parts inventories.
c. Do rough milling work on products.

d. Interview and process new employees in the personnel department.
e. Design new products.
f. Perform periodic preventive maintenance on general-use equipment.
g. Use the general factory building.
h. Issue purchase orders for a job.

Required:

Classify each of the activities above as either a unit-level, batch-level, product-level, or organization-sustaining activity.

EXERCISE 7-2 First Stage Allocation [LO7-2]

SecuriCorp operates a fleet of armored cars that make scheduled pickups and deliveries in the Los Angeles area. The company is implementing an activity-based costing system that has four activity cost pools: Travel, Pickup and Delivery, Customer Service, and Other. The activity measures are miles for the Travel cost pool, number of pickups and deliveries for the Pickup and Delivery

cost pool, and number of customers for the Customer Service cost pool. The Other cost pool has no activity measure because it is an organization-sustaining activity. The following costs will be assigned using the activity-based costing system:

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Driver and guard wages	$ 720,000
Vehicle operating expense	280,000
Vehicle depreciation	120,000
Customer representative salaries and expenses	160,000
Office expenses	30,000
Administrative expenses	320,000
Total cost	$1,630,000

The distribution of resource consumption across the activity cost pools is as follows:

	Travel	Pickup and Delivery	Customer Service	Other	Totals
Driver and guard wages	50%	35%	10%	5%	100%
Vehicle operating expense	70%	5%	0%	25%	100%
Vehicle depreciation	60%	15%	0%	25%	100%
Customer representative salaries and expenses	0%	0%	90%	10%	100%
Office expenses	0%	20%	30%	50%	100%
Administrative expenses	0%	5%	60%	35%	100%

Required:

Complete the first stage allocations of costs to activity cost pools as illustrated in Exhibit 7-6.

EXERCISE 7-3 Compute Activity Rates [LO7-3]

Green Thumb Gardening is a small gardening service that uses activity-based costing to estimate costs for pricing and other purposes. The proprietor of the company believes that costs are driven primarily by the size of customer lawns, the size of customer garden beds, the distance to travel to customers, and the number of customers. In addition, the costs of maintaining garden beds depends on whether the beds are low maintenance beds (mainly ordinary trees and shrubs) or high maintenance beds (mainly flowers and exotic plants). Accordingly, the company uses the five activity cost pools listed below:

Activity Cost Pool	Activity Measure
Caring for lawn	Square feet of lawn
Caring for garden beds–low maintenance	Square feet of low maintenance beds
Caring for garden beds–high maintenance	Square feet of high maintenance beds
Travel to jobs	Miles
Customer billing and service	Number of customers

The company has already completed its first stage allocations of costs and has summarized its annual costs and activity as follows:

Activity Cost Pool	Estimated Overhead Cost	Expected Activity
Caring for lawn	$72,000	150,000 square feet of lawn
Caring for garden beds–low maintenance	$26,400	20,000 square feet of low maintenance beds
Caring for garden beds–high maintenance	$41,400	15,000 square feet of high maintenance beds
Travel to jobs	$3,250	12,500 miles
Customer billing and service . . .	$8,750	25 customers

Required:

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Compute the activity rate for each of the activity cost pools.

EXERCISE 7-4 Second-Stage Allocation [LO7-4]

Klumper Corporation is a diversified manufacturer of industrial goods. The company's activity-based costing system contains the following six activity cost pools and activity rates:

Activity Cost Pool	Activity Rates
Supporting direct labor	$6.00 per direct labor-hour
Machine processing	$4.00 per machine-hour
Machine setups	$50.00 per setup
Production orders	$90.00 per order
Shipments	$14.00 per shipment
Product sustaining	$840.00 per product

Activity data have been supplied for the following two products:

	Total Expected Activity	
	K425	M67
Number of units produced per year	200	2,000
Direct labor-hours	80	500
Machine-hours	100	1,500
Machine setups	1	4
Production orders	1	4
Shipments	1	10
Product sustaining	1	1

Required:

Determine the total overhead cost that would be assigned to each of the products listed above in the activity-based costing system.

EXERCISE 7-5 Product and Customer Profitability Analysis [LO7-4, LO7-5]

Thermal Rising, Inc., makes paragliders for sale through specialty sporting goods stores. The company has a standard paraglider model, but also makes custom-designed paragliders. Management has designed an activity-based costing system with the following activity cost pools and activity rates:

Activity Cost Pool	Activity Rate
Supporting direct labor	$26 per direct labor-hour
Order processing	$284 per order
Custom design processing	$186 per custom design
Customer service	$379 per customer

Management would like an analysis of the profitability of a particular customer, Big Sky Outfitters, which has ordered the following products over the last 12 months:

	Standard Model	Custom Design
Number of gliders	20	3
Number of orders	1	3
Number of custom designs	0	3
Direct labor-hours per glider	26.35	28.00
Selling price per glider	$1,850	$2,400
Direct materials cost per glider	$564	$634

The company's direct labor rate is $19.50 per hour.

Required:

Using the company's activity-based costing system, compute the customer margin of Big Sky Outfitters.

EXERCISE 7-6 Cost Hierarchy [LO7-1]

CD Express, Inc., provides CD duplicating services to software companies. The customer provides a master CD from which CD Express makes copies. An order from a customer can be for a single copy or for thousands of copies. Most jobs are broken down into batches to allow smaller jobs, with higher priorities, to have access to the machines.

A number of activities carried out at CD Express are listed below.

a. Sales representatives' periodic visits to customers to keep them informed about the services provided by CD Express.
b. Ordering labels from the printer for a particular CD.
c. Setting up the CD duplicating machine to make copies from a particular master CD.
d. Loading the automatic labeling machine with labels for a particular CD.
e. Visually inspecting CDs and placing them by hand into protective plastic cases prior to shipping.
f. Preparation of the shipping documents for the order.
g. Periodic maintenance of equipment.
h. Lighting and heating the company's production facility.
i. Preparation of quarterly financial reports.

Required:

Classify each of the activities above as either a unit-level, batch-level, product-level, customer-level, or organization-sustaining activity. An order to duplicate a particular CD is a product-level activity. Assume the order is large enough that it must be broken down into batches.

EXERCISE 7-7 First-Stage Allocations [LO7-2]

The operations vice president of Security Home Bank has been interested in investigating the efficiency of the bank's operations. She has been particularly concerned about the costs of handling routine transactions at the bank and would like to compare these costs at the bank's various branches. If the branches with the most efficient operations can be identified, their methods can be studied and then replicated elsewhere. While the bank maintains meticulous records of wages and other costs, there has been no attempt thus far to show how those costs are related to the various services provided by the bank. The operations vice president has asked your help in conducting an activity-based costing study of bank operations. In particular, she would like to know the cost of opening an account, the cost of processing deposits and withdrawals, and the cost of processing other customer transactions.

The Westfield branch of Security Home Bank has submitted the following cost data for last year:

Teller wages	$160,000
Assistant branch manager salary	75,000
Branch manager salary	80,000
Total	$315,000

Virtually all other costs of the branch—rent, depreciation, utilities, and so on—are organization-sustaining costs that cannot be meaningfully assigned to individual customer transactions such as depositing checks.

In addition to the cost data above, the employees of the Westfield branch have been interviewed concerning how their time was distributed last year across the activities included in the activity-based costing study. The results of those interviews appear below:

Distribution of Resource Consumption Across Activities

	Opening Accounts	Processing Deposits and Withdrawals	Processing Other Customer Transactions	Other Activities	Total
Teller wages	5%	65%	20%	10%	100%
Assistant branch manager salary	15%	5%	30%	50%	100%
Branch manager salary	5%	0%	10%	85%	100%

Required:

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Prepare the first-stage allocation for the activity-based costing study. (See Exhibit 7-6 for an example of a first-stage allocation.)

EXERCISE 7-8 Computing and Interpreting Activity Rates [LO7-3]

(This exercise is a continuation of Exercise 7-7; it should be assigned *only* if Exercise 7-7 is also assigned.) The manager of the Westfield branch of Security Home Bank has provided the following data concerning the transactions of the branch during the past year:

Activity	Total Activity at the Westfield Branch
Opening accounts	500 new accounts opened
Processing deposits and withdrawals	100,000 deposits and withdrawals processed
Processing other customer transactions	5,000 other customer transactions processed

The lowest costs reported by other branches for these activities are displayed below:

Activity	Lowest Cost among All Security Home Bank Branches
Opening accounts	$26.75 per new account
Processing deposits and withdrawals	$1.24 per deposit or withdrawal
Processing other customer transactions	$11.86 per other customer transaction

Required:

1. Using the first-stage allocation from Exercise 7-7 and the above data, compute the activity rates for the activity-based costing system. (Use Exhibit 7-7 as a guide.) Round all computations to the nearest whole cent.
2. What do these results suggest to you concerning operations at the Westfield branch?

EXERCISE 7-9 Second-Stage Allocation to an Order [LO7-4]

Durban Metal Products, Ltd., of the Republic of South Africa makes specialty metal parts used in applications ranging from the cutting edges of bulldozer blades to replacement parts for Land Rovers. The company uses an activity-based costing system for internal decision-making purposes. The company has four activity cost pools as listed below:

Activity Cost Pool	Activity Measure	Activity Rate
Order size	Number of direct labor-hours	$16.85 per direct labor-hour
Customer orders	Number of customer orders	$320.00 per customer order
Product testing	Number of testing hours	$89.00 per testing hour
Selling	Number of sales calls	$1,090.00 per sales call

The managing director of the company would like information concerning the cost of a recently completed order for heavy-duty trailer axles. The order required 200 direct labor-hours, 4 hours of product testing, and 2 sales calls.

Required:

Prepare a report summarizing the overhead costs assigned to the order for heavy-duty trailer axles. What is the total overhead cost assigned to the order?

EXERCISE 7-10 Customer Profitability Analysis [LO7-3, LO7-4, LO7-5]


Worley Company buys surgical supplies from a variety of manufacturers and then resells and delivers these supplies to hundreds of hospitals. Worley sets its prices for all hospitals by marking up its cost of goods sold to those hospitals by 5%. For example, if a hospital buys supplies from Worley that had cost Worley $100 to buy from manufacturers, Worley would charge the hospital $105 to purchase these supplies.

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For years, Worley believed that the 5% markup covered its selling and administrative expenses and provided a reasonable profit. However, in the face of declining profits Worley decided to implement an activity-based costing system to help improve its understanding of customer profitability. The company broke its selling and administrative expenses into five activities as shown below:

Activity Cost Pool (Activity Measure)	Total Cost	Total Activity
Customer deliveries (Number of deliveries)	$ 500,000	5,000 deliveries
Manual order processing (Number of manual orders)	248,000	4,000 orders
Electronic order processing (Number of electronic orders)	200,000	12,500 orders
Line item picking (Number of line items picked)	450,000	450,000 line items
Other organization-sustaining costs (None)	602,000	
Total selling and administrative expenses	$2,000,000	

Worley gathered the data below for two of the many hospitals that it serves—University and Memorial (both hospitals purchased a total quantity of medical supplies that had cost Worley $30,000 to buy from its manufacturers):

	Activity	
Activity Measure	University	Memorial
Number of deliveries	10	25
Number of manual orders	0	30
Number of electronic orders	15	0
Number of line items picked	120	250

Required:

1. Compute the total revenue that Worley would receive from University and Memorial.
2. Compute the activity rate for each activity cost pool.
3. Compute the total activity costs that would be assigned to University and Memorial.
4. Compute Worley's customer margin for University and Memorial. (*Hint:* Do not overlook the $30,000 cost of goods sold that Worley incurred serving each hospital.)
5. Describe the purchasing behaviors that are likely to characterize Worley's least profitable customers.

EXERCISE 7-11 Second-Stage Allocation and Margin Calculations [LO7-4, LO7-5]

Foam Products, Inc., makes foam seat cushions for the automotive and aerospace industries. The company's activity-based costing system has four activity cost pools, which are listed below along with their activity measures and activity rates:

Activity Cost Pool	Activity Measure	Activity Rate
Supporting direct labor	Number of direct labor-hours	$5.55 per direct labor-hour
Batch processing	Number of batches	$107.00 per batch
Order processing	Number of orders	$275.00 per order
Customer service	Number of customers	$2,463.00 per customer

The company just completed a single order from Interstate Trucking for 1,000 custom seat cushions. The order was produced in two batches. Each seat cushion required 0.25 direct labor-hours. The selling price was $20 per unit, the direct materials cost was $8.50 per unit, and the direct labor cost was $6.00 per unit. This was Interstate Trucking's only order during the year.

Required:

Using Exhibit 7-12 as a guide, prepare a report showing the customer margin on sales to Interstate Trucking for the year.

EXERCISE 7-12 Activity Measures [LO7-1]

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Various activities at Ming Corporation, a manufacturing company, are listed below. Each activity has been classified as a unit-level, batch-level, product-level, or customer-level activity.

Activity	Level of Activity	Examples of Activity Measures
a. Direct labor workers assemble a product	Unit	
b. Products are designed by engineers	Product	
c. Equipment is set up	Batch	
d. Machines are used to shape and cut materials	Unit	
e. Monthly bills are sent out to regular customers	Customer	
f. Materials are moved from the receiving dock to production lines	Batch	
g. All completed units are inspected for defects	Unit	

Required:

Complete the table by providing an example of an activity measure for each activity.

EXERCISE 7-13 Computing ABC Product Costs [LO7-3, LO7-4]

Fogerty Company makes two products, titanium Hubs and Sprockets. Data regarding the two products follow:

	Direct Labor-Hours per Unit	Annual Production
Hubs	0.80	10,000 units
Sprockets	0.40	40,000 units

Additional information about the company follows:

a. Hubs require $32 in direct materials per unit, and Sprockets require $18.
b. The direct labor wage rate is $15 per hour.
c. Hubs are more complex to manufacture than Sprockets and they require special equipment.
d. The ABC system has the following activity cost pools:

Activity Cost Pool (Activity Measure)	Estimated Overhead Cost	Activity		
		Hubs	Sprockets	Total
Machine setups (number of setups)	$72,000	100	300	400
Special processing (machine-hours)	$200,000	5,000	0	5,000
General factory (organization-sustaining)	$816,000	NA	NA	NA

Required:

1. Compute the activity rate for each activity cost pool. Did you compute an activity rate for all of the activity cost pools? Why?
2. Determine the unit product cost of each product according to the ABC system.

EXERCISE 7-14 Calculating and Interpreting Activity-Based Costing Data [LO7-3, LO7-4]


Hiram's Lakeside is a popular restaurant located on Lake Washington in Seattle. The owner of the restaurant has been trying to better understand costs at the restaurant and has hired a student intern to conduct an activity-based costing study. The intern, in consultation with the owner, identified three major activities and then completed the first-stage allocations of costs to the activity cost pools. The results appear below.

Activity Cost Pool	Activity Measure	Total Cost	Total Activity
Serving a party of diners	Number of parties served	$33,000	6,000 parties
Serving a diner	Number of diners served	$138,000	15,000 diners
Serving drinks	Number of drinks ordered	$24,000	10,000 drinks

The above costs include all of the costs of the restaurant except for organization-sustaining costs such as rent, property taxes, and top-management salaries.

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A group of diners who ask to sit at the same table are counted as a party. Some costs, such as the costs of cleaning linen, are the same whether one person is at a table or the table is full. Other costs, such as washing dishes, depend on the number of diners served.

Prior to the activity-based costing study, the owner knew very little about the costs of the restaurant. She knew that the total cost for the month (including organization-sustaining costs) was $240,000 and that 15,000 diners had been served. Therefore, the average cost per diner was $16.

Required:

1. According to the activity-based costing system, what is the total cost of serving each of the following parties of diners?
   a. A party of four diners who order three drinks in total.
   b. A party of two diners who do not order any drinks.
   c. A lone diner who orders two drinks.
2. Convert the total costs you computed in (1) above to costs per diner. In other words, what is the average cost per diner for serving each of the following parties?
   a. A party of four diners who order three drinks in total.
   b. A party of two diners who do not order any drinks.
   c. A lone diner who orders two drinks.
3. Why do the costs per diner for the three different parties differ from each other and from the overall average cost of $16 per diner?

EXERCISE 7-15 Comprehensive Activity-Based Costing Exercise [LO7-2, LO7-3, LO7-4, LO7-5]

Advanced Products Corporation has supplied the following data from its activity-based costing system:

Overhead Costs	
Wages and salaries	$300,000
Other overhead costs	100,000
Total overhead costs	$400,000

Activity Cost Pool	Activity Measure	Total Activity for the Year
Supporting direct labor	Number of direct labor-hours	20,000 DLHs
Order processing	Number of customer orders	400 orders
Customer support	Number of customers	200 customers
Other	This is an organization-sustaining activity	Not applicable

Distribution of Resource Consumption Across Activities

	Supporting Direct Labor	Order Processing	Customer Support	Other	Total
Wages and salaries	40%	30%	20%	10%	100%
Other overhead costs	30%	10%	20%	40%	100%

During the year, Advanced Products completed one order for a new customer, Shenzhen Enterprises. This customer did not order any other products during the year. Data concerning that order follow:

Data concerning the Shenzhen Enterprises Order	
Units ordered	10 units
Direct labor-hours	2 DLHs per unit
Selling price	$300 per unit
Direct materials	$180 per unit
Direct labor	$50 per unit

Required:

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1. Using Exhibit 7-6 as a guide, prepare a report showing the first-stage allocations of overhead costs to the activity cost pools.
2. Using Exhibit 7-7 as a guide, compute the activity rates for the activity cost pools.
3. Prepare a report showing the overhead costs for the order from Shenzhen Enterprises including customer support costs.
4. Using Exhibit 7-12 as a guide, prepare a report showing the customer margin for Shenzhen Enterprises.

Problems

All applicable problems are available with McGraw-Hill's *Connect® Accounting*.

PROBLEM 7-16 Comparing Traditional and Activity-Based Product Margins [LO7-1, LO7-3, LO7-4, LO7-5]

Hi-Tek Manufacturing Inc. makes two types of industrial component parts—the B300 and the T500. An absorption costing income statement for the most recent period is shown below:

Hi-Tek Manufacturing Inc. Income Statement	
Sales	$2,100,000
Cost of goods sold	1,600,000
Gross margin	500,000
Selling and administrative expenses	550,000
Net operating loss	$ (50,000)

Hi-Tek produced and sold 70,000 units of B300 at a price of $20 per unit and 17,500 units of T500 at a price of $40 per unit. The company's traditional cost system allocates manufacturing overhead to products using a plantwide overhead rate and direct labor dollars as the allocation base. Additional information relating to the company's two product lines is shown below:

	B300	T500	Total
Direct materials	$436,300	$251,700	$ 688,000
Direct labor	$200,000	$104,000	304,000
Manufacturing overhead			608,000
Cost of goods sold			$1,600,000

The company has created an activity-based costing system to evaluate the profitability of its products. Hi-Tek's ABC implementation team concluded that $50,000 and $100,000 of the company's advertising expenses could be directly traced to B300 and T500, respectively. The remainder of the selling and

administrative expenses was organization-sustaining in nature. The ABC team also distributed the company's manufacturing overhead to four activities as shown below:

Activity Cost Pool (and Activity Measure)	Manufacturing Overhead	Activity		
		B300	T500	Total
Machining (machine-hours)	$213,500	90,000	62,500	152,500
Setups (setup hours)	157,500	75	300	375
Product-sustaining (number of products)	120,000	1	1	2
Other (organization-sustaining costs)	117,000	NA	NA	NA
Total manufacturing overhead cost	$608,000			

Required:

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1. Using Exhibit 7-13 as a guide, compute the product margins for the B300 and T500 under the company's traditional costing system.
2. Using Exhibit 7-11 as a guide, compute the product margins for B300 and T500 under the activity-based costing system.
3. Using Exhibit 7-14 as a guide, prepare a quantitative comparison of the traditional and activity-based cost assignments. Explain why the traditional and activity-based cost assignments differ.

PROBLEM 7-17 Comparing Traditional and Activity-Based Product Margins [LO7-1, LO7-3, LO7-4, LO7-5]

Smoky Mountain Corporation makes two types of hiking boots—Xtreme and the Pathfinder. Data concerning these two product lines appear below:

	Xtreme	Pathfinder
Selling price per unit	$140.00	$99.00
Direct materials per unit	$72.00	$53.00
Direct labor per unit	$24.00	$12.00
Direct labor-hours per unit	2.0 DLHs	1.0 DLHs
Estimated annual production and sales	20,000 units	80,000 units

The company has a traditional costing system in which manufacturing overhead is applied to units based on direct labor-hours. Data concerning manufacturing overhead and direct labor-hours for the upcoming year appear below:

Estimated total manufacturing overhead	$1,980,000
Estimated total direct labor-hours	120,000 DLHs

Required:

1. Using Exhibit 7-13 as a guide, compute the product margins for the Xtreme and the Pathfinder products under the company's traditional costing system.
2. The company is considering replacing its traditional costing system with an activity-based costing system that would assign its manufacturing overhead to the following four activity cost pools (the Other cost pool includes organization-sustaining costs and idle capacity costs):

Activities and Activity Measures	Estimated Overhead Cost	Expected Activity Xtreme	Pathfinder	Total
Supporting direct labor (direct labor-hours)	$ 783,600	40,000	80,000	120,000
Batch setups (setups)	495,000	200	100	300
Product sustaining (number of products)	602,400	1	1	2
Other	99,000	NA	NA	NA
Total manufacturing overhead cost	$1,980,000			

Using Exhibit 7-11 as a guide, compute the product margins for the Xtreme and the Pathfinder products under the activity-based costing system.

3. Using Exhibit 7-14 as a guide, prepare a quantitative comparison of the traditional and activity-based cost assignments. Explain why the traditional and activity-based cost assignments differ.

PROBLEM 7-18 Activity-Based Costing and Bidding on Jobs [LO7-2, LO7-3, LO7-4]


Mercer Asbestos Removal Company removes potentially toxic asbestos insulation and related products from buildings. There has been a long-simmering dispute between the company's estimator and the work supervisors. The on-site supervisors claim that the estimators do not adequately distinguish between routine work such as removal of asbestos insulation around heating pipes in older homes and nonroutine work such as removing asbestos-contaminated ceiling plaster in

industrial buildings. The on-site supervisors believe that nonroutine work is far more expensive than routine work and should bear higher customer charges. The estimator sums up his position in this way: "My job is to measure the area to be cleared of asbestos. As directed by top management, I simply multiply the square footage by $2.50 to determine the bid price. Since our average cost is only $2.175 per square foot, that leaves enough cushion to take care of the additional costs of nonroutine work that shows up. Besides, it is difficult to know what is routine or not routine until you actually start tearing things apart."

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To shed light on this controversy, the company initiated an activity-based costing study of all of its costs. Data from the activity-based costing system follow:

Activity Cost Pool	Activity Measure	Total Activity
Removing asbestos	Thousands of square feet	800 thousand square feet
Estimating and job setup	Number of jobs	500 jobs
Working on nonroutine jobs	Number of nonroutine jobs	100 nonroutine jobs
Other (costs of idle capacity and organization-sustaining costs)	None	

Note: The 100 nonroutine jobs are included in the total of 500 jobs. Both nonroutine jobs and routine jobs require estimating and setup.

Costs for the Year	
Wages and salaries	$ 300,000
Disposal fees	700,000
Equipment depreciation	90,000
On-site supplies	50,000
Office expenses	200,000
Licensing and insurance	400,000
Total cost	$1,740,000

Distribution of Resource Consumption Across Activities

	Removing Asbestos	Estimating and Job Setup	Working on Nonroutine Jobs	Other	Total
Wages and salaries	50%	10%	30%	10%	100%
Disposal fees	60%	0%	40%	0%	100%
Equipment depreciation	40%	5%	20%	35%	100%
On-site supplies	60%	30%	10%	0%	100%
Office expenses	10%	35%	25%	30%	100%
Licensing and insurance	30%	0%	50%	20%	100%

Required:

1. Using Exhibit 7-6 as a guide, perform the first-stage allocation of costs to the activity cost pools.
2. Using Exhibit 7-7 as a guide, compute the activity rates for the activity cost pools.
3. Using the activity rates you have computed, determine the total cost and the average cost per thousand square feet of each of the following jobs according to the activity-based costing system.

a. A routine 1,000-square-foot asbestos removal job.
b. A routine 2,000-square-foot asbestos removal job.
c. A nonroutine 2,000-square-foot asbestos removal job.

4. Given the results you obtained in (3) above, do you agree with the estimator that the company's present policy for bidding on jobs is adequate?

PROBLEM 7-19 Second Stage Allocations and Product Margins [LO7-4, LO7-5]

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Pixel Studio, Inc., is a small company that creates computer-generated animations for films and television. Much of the company's work consists of short commercials for television, but the company also does realistic computer animations for special effects in movies.

The young founders of the company have become increasingly concerned with the economics of the business—particularly since many competitors have sprung up recently in the local area. To help understand the company's cost structure, an activity-based costing system has been designed. Three major activities are carried out in the company: animation concept, animation production, and contract administration. The animation concept activity is carried out at the contract proposal stage when the company bids on projects. This is an intensive activity that involves individuals from all parts of the company in creating story boards and prototype stills to be shown to the prospective client. Once a project is accepted by the client, the animation goes into production and contract administration begins. Almost all of the work involved in animation production is done by the technical staff, whereas the administrative staff is largely responsible for contract administration. The activity cost pools and their activity measures are listed below:

Activity Cost Pool	Activity Measure	Activity Rate
Animation concept	Number of proposals	$6,040 per proposal
Animation production	Minutes of completed animation	$7,725 per minute
Contract administration	Number of contracts	$6,800 per contract

These activity rates include all of the company's costs, except for the costs of idle capacity and organization-sustaining costs. There are no direct labor or direct materials costs.

Preliminary analysis using these activity rates has indicated that the local commercial segment of the market may be unprofitable. This segment is highly competitive. Producers of local commercials may ask three or four companies like Pixel Studio to bid, which results in an unusually low ratio of accepted contracts to bids. Furthermore, the animation sequences tend to be much shorter for local commercials than for other work. Since animation work is billed at fairly standard rates according to the running time of the completed animation, this means that the revenues from these short projects tend to be below average. Data concerning activity in the local commercial market appear below:

Activity Measure	Local Commercials
Number of proposals	25
Minutes of completed animation	5
Number of contracts	10

The total sales from the 10 contracts for local commercials was $180,000.

Required:

1. Determine the cost of serving the local commercial market.

2. Prepare a report showing the margin earned serving the local commercial market. (Remember, this company has no direct materials or direct labor costs.)
3. What would you recommend to management concerning the local commercial market?

PROBLEM 7-20 Evaluating the Profitability of Services [LO7-2, LO7-3, LO7-4, LO7-5]


Gallatin Carpet Cleaning is a small, family-owned business operating out of Bozeman, Montana. For its services, the company has always charged a flat fee per hundred square feet of carpet cleaned. The current fee is $28 per hundred square feet. However, there is some question about whether the company is actually making any money on jobs for some customers—particularly those located on remote ranches that require considerable travel time. The owner's daughter, home for the summer from college, has suggested investigating this question using activity-based

costing. After some discussion, a simple system consisting of four activity cost pools seemed to be adequate. The activity cost pools and their activity measures appear below:

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Activity Cost Pool	Activity Measure	Activity for the Year
Cleaning carpets	Square feet cleaned (00s)	20,000 hundred square feet
Travel to jobs	Miles driven	60,000 miles
Job support	Number of jobs	2,000 jobs
Other (costs of idle capacity and organization-sustaining costs)	None	Not applicable

The total cost of operating the company for the year is $430,000, which includes the following costs:

Wages	$150,000
Cleaning supplies	40,000
Cleaning equipment depreciation	20,000
Vehicle expenses	80,000
Office expenses	60,000
President's compensation	80,000
Total cost	$430,000

Resource consumption is distributed across the activities as follows:

Distribution of Resource Consumption Across Activities

	Cleaning Carpets	Travel to Jobs	Job Support	Other	Total
Wages	70%	20%	0%	10%	100%
Cleaning supplies	100%	0%	0%	0%	100%
Cleaning equipment depreciation	80%	0%	0%	20%	100%
Vehicle expenses	0%	60%	0%	40%	100%
Office expenses	0%	0%	45%	55%	100%
President's compensation	0%	0%	40%	60%	100%

Job support consists of receiving calls from potential customers at the home office, scheduling jobs, billing, resolving issues, and so on.

Required:

1. Using Exhibit 7-6 as a guide, prepare the first-stage allocation of costs to the activity cost pools.
2. Using Exhibit 7-7 as a guide, compute the activity rates for the activity cost pools.
3. The company recently completed a 5 hundred square foot carpet-cleaning job at the Flying N ranch—a 75-mile round-trip journey from the company's offices in Bozeman. Compute the cost of this job using the activity-based costing system.
4. The revenue from the Flying N ranch was $140 (5 hundred square feet @ $28 per hundred square feet). Using Exhibit 7-12 as a guide, prepare a report showing the margin from this job.
5. What do you conclude concerning the profitability of the Flying N ranch job? Explain.
6. What advice would you give the president concerning pricing jobs in the future?

Appendix 7A: ABC Action Analysis

LO7-6

Prepare an action analysis report using activity-based costing data and interpret the report.

A conventional ABC analysis, such as the one presented in Exhibits 7-11 and 7-12 in the chapter, has several important limitations. Referring back to Exhibit 7-11, recall that the custom compass housings show a negative product margin of $49,500. Because of this apparent loss, managers were considering dropping this product. However, as the discussion among the managers revealed, it is unlikely that all of the $589,500 cost of the product would be avoided if it were dropped. Some of these costs would continue even if the product were totally eliminated. *Before* taking action, it is vital to identify which costs would be avoided and which costs would continue. Only those costs that can be avoided are relevant in the decision. Moreover, many of the costs are managed costs that would require explicit management action to eliminate. If the custom compass housings product line were eliminated, the direct materials cost would be avoided without any explicit management action—the materials simply wouldn't be ordered. On the other hand, if the custom compass housings were dropped, explicit management action would be required to eliminate the salaries of overhead workers that are assigned to this product.

Simply shifting these managed costs to other products would not solve anything. These costs would have to be eliminated or redeployed to increase sales to have any benefit to the company. While eliminating the cost is obviously beneficial, redeploying the resources is only beneficial if the resources are used to expand the output of a work center that has been operating at full capacity. If the resources are redeployed to a work center with idle capacity, the additional resources would only increase the excess capacity in that work center—which has no direct benefit to the company.

In addition, if some overhead costs need to be eliminated as a result of dropping a product, specific managers must be held responsible for eliminating those costs or the reductions are unlikely to occur. If no one is specifically held responsible for eliminating the costs, they will almost certainly continue to be incurred. Without external pressure, managers usually avoid cutting costs in their areas of responsibility. The action analysis report developed in this appendix is intended to help top managers identify what costs are relevant in a decision and to place responsibility for the elimination of those costs on the appropriate managers.

Activity Rates—Action Analysis Report

Constructing an action analysis report begins with the results of the first-stage allocation, which is reproduced as Exhibit 7A-1 (page 332). In contrast to the conventional ABC analysis covered in the chapter, the calculation of the activity rates for an action analysis report is a bit more involved. In addition to computing an overall activity rate for each activity cost pool, an activity rate is computed for each cell in Exhibit 7A-1. The computations of activity rates for the action analysis are carried

out in Exhibit 7A-2 (page 332). For example, the $125,000 cost of indirect factory wages for the Customer Orders cost pool is divided by the total activity for that cost pool—1,000 orders—to arrive at the activity rate of $125 per customer order for indirect factory wages. Similarly, the $200,000 cost of indirect factory wages for the Product Design cost pool is divided by the total activity for that cost pool—400 designs—to arrive at the activity rate of $500 per design for indirect factory wages. Note that the totals at the bottom of Exhibit 7A-2 agree with the overall activity rates in Exhibit 7-7 in the chapter. Exhibit 7A-2, which shows the activity rates for the action analysis report, contains more detail than Exhibit 7-7, which contains the activity rates for the conventional ABC analysis.

Assignment of Overhead Costs to Products—Action Analysis Report

Computing the overhead costs to be assigned to products for an action analysis report also involves more detail than for a conventional ABC analysis. The computations for Classic Brass are carried out in Exhibit 7A-3. For example, the activity rate of $125 per customer order for indirect factory wages is multiplied by 600 orders for the standard stanchions to arrive at the cost of $75,000 for indirect factory wages in Exhibit 7A-3. Instead of just a single cost number for each cost pool as in the conventional ABC analysis, we now have an entire cost matrix showing much more detail. Note that the column totals for the cost matrix in Exhibit 7A-3 agree with the ABC costs for standard stanchions in Exhibit 7-9. Indeed, the conventional ABC analysis of Exhibit 7-11 can be easily constructed using the column totals at the bottom of the cost matrices in Exhibit 7A-3. In contrast, the action analysis report will be based on the row totals at the right of the cost matrices in Exhibit 7A-3. In addition, the action analysis report will include a simple color-coding scheme that will help managers identify how easily the various costs can be adjusted.

EXHIBIT 7A–1
First-Stage Allocations to Activity Cost Pools

	Activity Cost Pools					
	Customer Orders	Product Design	Order Size	Customer Relations	Other	Total
Production Department:						
Indirect factory wages	$ 125,000	$ 200,000	$ 100,000	$ 50,000	$ 25,000	$ 500,000
Factory equipment depreciation	60,000	0	180,000	0	60,000	300,000
Factory utilities	0	12,000	60,000	0	48,000	120,000
Factory building lease	0	0	0	0	80,000	80,000
General Administrative Department:						
Administrative wages and salaries	60,000	20,000	40,000	120,000	160,000	400,000
Office equipment depreciation	15,000	0	0	12,500	22,500	50,000
Administrative building lease	0	0	0	0	60,000	60,000
Marketing Department:						
Marketing wages and salaries	55,000	20,000	0	150,000	25,000	250,000
Selling expenses	5,000	0	0	35,000	10,000	50,000
Total cost	$ 320,000	$ 252,000	$ 380,000	$ 367,500	$ 490,500	$ 1,810,000

Exhibit 7A-1 | Exhibit 7A-2 | Exhibit 7A-3A | Exhibit 7A-3B | Exhibit

EXHIBIT 7A–2
Computation of the Activity Rates for the Action Analysis Report

	Activity Cost Pools				
	Customer Orders	Product Design	Order Size	Customer Relations	Other
Total activity	1,000 orders	400 product designs	20,000 machine-hours	250 active customers	Not applicable*
Production Department:					
Indirect factory wages	$ 125	$ 500	$ 5	$ 200	
Factory equipment depreciation	60	0	9	0	
Factory utilities	0	30	3	0	
Factory building lease	0	0	0	0	
General Administrative Department:					
Administrative wages and salaries	60	50	2	480	
Office equipment depreciation	15	0	0	50	
Administrative building lease	0	0	0	0	
Marketing Department:					
Marketing wages and salaries	55	50	0	600	
Selling expenses	5	0	0	140	
Total (conventional ABC analysis)	$ 320	$ 630	$ 19	$ 1,470	

*Activity rates are not computed for the Other cost pool since these costs will not be allocated further.

Exhibit 7A-1 | Exhibit 7A-2 | Exhibit 7A-3A | Exhibit 7A-3B | Exhibit 7A-5 | Activity rates

$125,000 ÷ 1,000 orders = $125 per order.

Other entries in the table are computed similarly.

EXHIBIT 7A–3
Action Analysis Cost Matrices

	A	B	C	D	E	F
1	**Action Analysis Cost Matrix for Standard Stanchions**					
3		*Activity Cost Pools*				
4		*Customer Orders*	*Product Design*	*Order Size*	*Customer Relations*	*Total*
6	Total activity for stanchions	600		17,500	Not	
7		orders	product designs	machine-hours	applicable	
9	Production Department:					
10	Indirect factory wages	$ 75,000	$ 0	$ 87,500		$ 162,500
11	Factory equipment depreciation	36,000	0	157,500		193,500
12	Factory utilities	0	0	52,500		52,500
13	Factory building lease	0	0	0		0
15	General Administrative Department:					
16	Administrative wages and salaries	36,000	0	35,000		71,000
17	Office equipment depreciation	9,000	0	0		9,000
18	Administrative building lease	0	0	0		0
20	Marketing Department:					
21	Marketing wages and salaries	33,000	0	0		33,000
22	Selling expenses	3,000	0	0		3,000
24	Total (conventional ABC analysis)	$ 192,000	$ 0	$ 332,500		$ 524,500
25						

Exhibit 7A-1 | Exhibit 7A-2 | **Exhibit 7A-3A** | Exhibit 7A-

From Exhibit 7A–2, the activity rate for indirect factory wages for the Customer Orders cost pool is $125 per order.

$125 per order × 600 orders = $75,000

Other entries in the table are computed in a similar way.

	A	B	C	D	E	F
1	**Action Analysis Cost Matrix for the Custom Compass Housings**					
3		*Activity Cost Pools*				
4		*Customer Orders*	*Product Design*	*Order Size*	*Customer Relations*	*Total*
6	Total activity for custom compass housings	400	400	2,500	Not	
7		order	product design	machine-hours	applicable	
9	Production Department:					
10	Indirect factory wages	$ 50,000	$ 200,000	$ 12,500		$ 262,500
11	Factory equipment depreciation	24,000	0	22,500		46,500
12	Factory utilities	0	12,000	7,500		19,500
13	Factory building lease	0	0	0		0
15	General Administrative Department:					
16	Administrative wages and salaries	24,000	20,000	5,000		49,000
17	Office equipment depreciation	6,000	0	0		6,000
18	Administrative building lease	0	0	0		0
20	Marketing Department:					
21	Marketing wages and salaries	22,000	20,000	0		42,000
22	Selling expenses	2,000	0	0		2,000
24	Total (conventional ABC analysis)	$ 128,000	$ 252,000	$ 47,500		$ 427,500
25						

Exhibit 7A-2 | Exhibit 7A-3A | **Exhibit 7A-3B** | Exhibit 7A-

From Exhibit 7A–2, the activity rate for indirect factory wages for the Customer Orders cost pool is $125 per order.

$125 per order × 400 orders = $50,000

Other entries in the table are computed in a similar way.

Ease of Adjustment Codes

The ABC team constructed Exhibit 7A-4 to aid managers in the use of the ABC data. In this exhibit, each cost has been assigned an *ease of adjustment code*—Green, Yellow, or Red. The **ease of adjustment code** reflects how easily the cost could be adjusted to changes in activity.[4] "Green" costs are those costs that would adjust more or less automatically to changes in activity without any action by managers. For example, direct materials costs would adjust to changes in orders without any action being taken by managers. If a customer does not order stanchions, the direct materials for the stanchions would not be required and would not be ordered. "Yellow" costs are those costs that could be adjusted in response to changes in activity, but such adjustments require management action; the adjustment is not automatic. The ABC team believes, for example, that direct labor costs should be included in the Yellow category. Managers must make difficult decisions and take explicit action to increase or decrease, in aggregate, direct labor costs—particularly because the company has a no lay-off policy. "Red" costs are costs that could be adjusted to changes in activity only with a great deal of difficulty, and the adjustment would require management action. The building leases fall into this category because it would be very difficult and expensive to break the leases.

The Action Analysis View of the ABC Data

Looking at Exhibit 7A-3, the totals on the right-hand side of the table indicate that the $427,500 of overhead cost for the custom compass housings consists of $262,500 of indirect factory wages, $46,500 of factory equipment depreciation, and so on. These data are displayed in Exhibit 7A-5, which shows an action analysis of the custom compass housings product. An action analysis report shows what costs have been assigned to the cost object, such as a product or customer, and how difficult it would be to adjust the cost if there is a change in activity. Note that the Red margin at the bottom of Exhibit 7A-5, $(49,500), is exactly the same as the product margin for the custom compass housings in Exhibit 7-11 in the chapter.

EXHIBIT 7A-4
Ease of Adjustment Codes

Green: *Costs that adjust automatically to changes in activity without management action.*

Direct materials
Shipping costs

Yellow: *Costs that could, in principle, be adjusted to changes in activity, but management action would be required.*

Direct labor
Indirect factory wages
Factory utilities
Administrative wages and salaries
Office equipment depreciation
Marketing wages and salaries
Selling expenses

Red: *Costs that would be very difficult to adjust to changes in activity and management action would be required.*

Factory equipment depreciation
Factory building lease
Administrative building lease

EXHIBIT 7A-5

Action Analysis of Custom Compass Housings: Activity-Based Costing System

	A	B	C
1	**Custom Compass Housings**		
2	Sales (from Exhibit 7-11)		$ 540,000
4	Green costs:		
5	Direct materials (from Exhibit 7-11)	$ 69,500	
6	Shipping (from Exhibit 7-11)	5,000	74,500
7	Green margin		465,500
9	Yellow costs:		
10	Direct labor (from Exhibit 7-11)	87,500	
11	Indirect factory wages (from Exhibit 7A-3)	262,500	
12	Factory utilities (from Exhibit 7A-3)	19,500	
13	Administrative wages and salaries (from Exhibit 7A-3)	49,000	
14	Office equipment depreciation (from Exhibit 7A-3)	6,000	
15	Marketing wages and salaries (from Exhibit 7A-3)	42,000	
16	Selling expenses (from Exhibit 7A-3)	2,000	468,500
17	Yellow margin		(3,000)
19	Red costs:		
20	Factory equipment depreciation (from Exhibit 7A-3)	46,500	
21	Factory building lease (from Exhibit 7A-3)	0	
22	Administrative building lease (from Exhibit 7A-3)	0	46,500
23	Red margin		$ (49,500)
24			

Exhibit 7A-5 | Activity rates | Stanchio

The cost data in the action analysis in Exhibit 7A-5 are arranged by the color coded ease of adjustment. All of the Green costs—those that adjust more or less automatically to changes in activity—appear together at the top of the list of costs. These costs total $74,500 and are subtracted from the sales of $540,000 to yield a Green margin of $465,500. The same procedure is followed for the Yellow and Red costs. This action analysis indicates what costs would have to be cut and how difficult it would be to cut them if the custom compass housings product were dropped. Prior to making any decision about dropping products, the managers responsible for the costs must agree to either eliminate the resources represented by those costs or to transfer the resources to an area in the organization that really needs the resources. If managers do not make such a commitment, it is likely that the costs would continue to be incurred. As a result, the company would lose the sales from the products without really eliminating the costs.

After the action analysis was prepared by the ABC team, top management at Classic Brass met once again to review the results of the ABC analysis.

John: When we last met, we had discussed the advisability of discontinuing the custom compass housings product line. I understand that the ABC team has done some additional analysis to help us in making this decision.

Mary: That's right. The action analysis report we put together indicates how easy it would be to adjust each cost and where specific cost savings would have to come from if we were to drop the custom compass housings.

John: What's this red margin at the bottom of the action analysis? Isn't that a product margin?

Mary: Yes, it is. However, we call it a red margin because we should stop and think very, very carefully before taking any actions based on that margin.

John: Why is that?

Mary: As an example, we subtracted the costs of factory equipment depreciation to arrive at that red margin. We doubt that we could avoid any of that cost if we were to drop custom orders. We use the same machines on custom orders that we use on standard products. The factory equipment has no resale value, and it does not wear out through use.

John: What about this yellow margin?

Mary: Yellow means proceed with a great deal of caution. To get to the yellow margin we deducted from sales numerous costs that could be adjusted only if the managers involved are willing to eliminate resources or shift them to another department in an effort to grow sales.

John: If I understand the yellow margin correctly, the apparent loss of $3,000 on the custom compass housings is the result of the indirect factory wages of $262,500.

Susan: Right, that's basically the wages of our design engineers.

John: I am uncomfortable with the idea of laying off any of our designers for numerous reasons. So where does that leave us?

Mary: What about raising prices on our custom products?

Tom: We should be able to do that. We have been undercutting the competition to make sure that we won bids on custom work because we thought it was a very profitable thing to do.

John: Why don't we just charge directly for design work?

Tom: Some of our competitors already do that. However, I don't think we would be able to charge enough to cover our design costs.

John: Can we do anything to make our design work more efficient so it costs us less? I'm not going to lay anyone off, but if we make the design process more efficient, we could lower the charge for design work and spread those costs across more customers.

Susan: That may be possible. I'll form a process improvement team to look at it.

John: Let's get some benchmark data on design costs. If we set our minds to it, I'm sure we can be world class in no time.

Susan: Okay. Mary, will you help with the benchmark data?

Mary: Sure.

John: Let's meet again in about a week to discuss our progress. Is there anything else on the agenda for today?

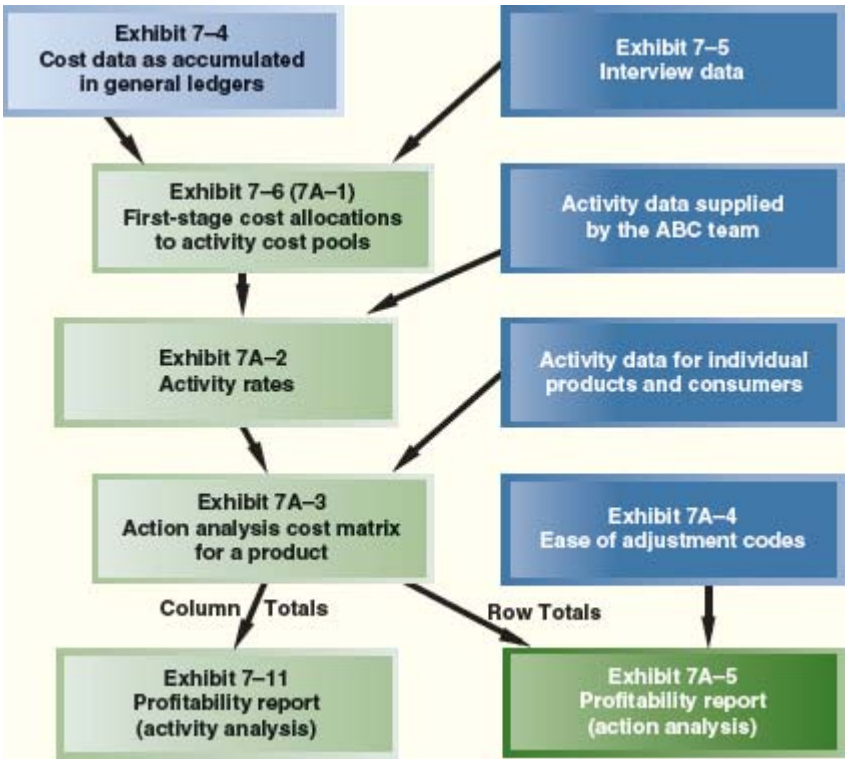
The points raised in the preceding discussion are extremely important. By measuring the resources consumed by products (and other cost objects), an ABC system provides a much better basis for decision making than a traditional cost accounting system that spreads overhead costs around without much regard for what might be causing the overhead. A well-designed ABC system provides managers with estimates of potentially relevant costs that can be a very useful starting point for management analysis.

Summary (Appendix 7A)

The action analysis report illustrated in this appendix is a valuable addition to the ABC toolkit. An action analysis report provides more information for decision making than a conventional ABC analysis. The action analysis report makes it clear where costs would have to be adjusted in the organization as a result of an action. In a conventional ABC analysis, a cost such as $320 for processing an order represents costs from many parts of the organization. If an order is dropped, there will be little pressure to actually eliminate the $320 cost unless it is clear where the costs are incurred and which managers would be responsible for reducing the cost. In contrast, an action analysis report traces the costs to where they are incurred in the organization and makes it much easier to assign responsibility to managers for reducing costs. In addition, an action analysis report provides information concerning how easily a cost can be adjusted. Costs that cannot be adjusted are not relevant in a decision.

Exhibit 7A-6 summarizes all of the steps required to create both an action analysis report as illustrated in this appendix and an activity analysis as shown in the chapter.

EXHIBIT 7A-6
Summary of the Steps to Produce an Action Analysis Report



Review Problem: Activity Analysis Report

Refer to the data for Ferris Corporation in the Review Problem at the end of the chapter on pages 312–314.

Required:

1. Compute activity rates for Ferris Corporation as in Exhibit 7A-2.
2. Using Exhibit 7A-3 as a guide, construct a table showing the overhead costs for the OfficeMart orders described in requirement (3) of the Review Problem at the end of the chapter.
3. The management of Ferris Corporation has assigned ease of adjustment codes to costs as follows:

Cost	Ease of Adjustment Code
Direct materials	Green
Direct labor	Yellow
Manufacturing overhead	Yellow
Selling and administrative overhead	Red

Using Exhibit 7A-5 as a guide, prepare an action analysis of the OfficeMart orders.

Solution to Review Problem

1. The activity rates for the activity cost pools are:

	Assembling Units	Processing Orders	Supporting Customers
Total activity	1,000 units	250 orders	100 customers
Manufacturing overhead	$250	$ 700	$ 250
Selling and administrative overhead	30	540	750
Total	$280	$1,240	$1,000

2.

The overhead cost for the four orders of a total of 80 filing cabinets would be computed as follows: Page 338

	Assembling Units	Processing Orders	Supporting Customers	Total
Activity	80 units	4 orders	1 customer	
Manufacturing overhead	$20,000	$2,800	$ 250	$23,050
Selling and administrative overhead	2,400	2,160	750	5,310
Total	$22,400	$4,960	$1,000	$28,360

3. The action analysis report is:

Sales		$47,600
Green costs:		
Direct materials	$14,400	14,400
Green margin		33,200
Yellow costs:		
Direct labor	4,000	
Manufacturing overhead	23,050	27,050
Yellow margin		6,150
Red costs:		
Selling and administrative overhead	5,310	5,310
Red margin		$ 840

Glossary (Appendix 7A)

Ease of adjustment codes Costs are coded as Green, Yellow, or Red—depending on how easily the cost could be adjusted to changes in activity. "Green" costs adjust automatically to changes in activity. "Yellow" costs could be adjusted in response to changes in activity, but such adjustments require management action; the adjustment is not automatic. "Red" costs could be adjusted to changes in activity only with a great deal of difficulty and would require management action. (p. 334)

Appendix 7A Exercises and Problems

All applicable exercises and problems are available with McGraw-Hill's *Connect*® *Accounting.*

EXERCISE 7A-1 Preparing an Action Analysis Report [LO7-6]

Fairway Golf Corporation produces private label golf clubs for pro shops throughout North America. The company uses activity-based costing to evaluate the profitability of serving its customers. This analysis is based on categorizing the company's costs as follows, using the ease of adjustment color coding scheme described in Appendix 7A:

	Ease of Adjustment Code
Direct materials	Green
Direct labor	Yellow
Indirect labor	Yellow
Factory equipment depreciation	Red
Factory administration	Red
Selling and administrative wages and salaries	Red
Selling and administrative depreciation	Red
Marketing expenses	Yellow

Management would like to evaluate the profitability of a particular customer—Shaker Run Golf Club of Lebanon, Ohio. Over the last twelve months this customer submitted one order for 100 golf clubs that had to be produced in four batches due to differences in product labeling requested by the customer. Summary data concerning the order appear below:

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Number of clubs	100
Number of orders	1
Number of batches	4
Direct labor-hours per club	0.3
Selling price per club	$50.00
Direct materials cost per club	$29.50
Direct labor rate per hour	$20.50

A cost analyst working in the controller's office at the company has already produced the action analysis cost matrix for the Shaker Run Golf Club that appears below:

Action Analysis Cost Matrix for Shaker Run Golf Club

	Activity Cost Pools				
	Supporting Direct labor	Batch Processing	Order Processing	Customer Service	Total
Activity	30 direct labor-hours	4 batches	1 order	1 customer	
Manufacturing overhead:					
Indirect labor	$ 35.40	$53.70	$ 6.80	$ 0.00	$ 95.90
Factory equipment depreciation	102.80	0.90	0.00	0.00	103.70
Factory administration	18.50	0.50	12.00	228.00	259.00
Selling and administrative overhead:					
Wages and salaries	11.00	0.00	36.00	382.00	429.00
Depreciation	0.00	0.00	6.00	24.00	30.00
Marketing expenses	117.70	0.00	54.00	369.00	540.70
Total	$285.40	$55.10	$114.80	$1,003.00	$1,458.30

Required:

Prepare an action analysis report showing the profitability of the Shaker Run Golf Club. Include direct materials and direct labor costs in the report. Use Exhibit 7A-5 as a guide for organizing the report.

EXERCISE 7A-2 Second-Stage Allocation Using the Action Analysis Approach [LO7-4, LO7-6]

This exercise should be assigned in conjunction with Exercise 7-9.

The results of the first-stage allocation of the activity-based costing system at Durban Metal Products, Ltd., in which the activity rates were computed, appear below:

	Order Size	Customer Orders	Product Testing	Selling
Manufacturing overhead:				
Indirect labor	$ 8.25	$180.00	$30.00	$ 0.00
Factory depreciation	8.00	0.00	40.00	0.00
Factory utilities	0.10	0.00	1.00	0.00
Factory administration	0.00	48.00	18.00	30.00
Selling and administrative:				
Wages and salaries	0.50	80.00	0.00	800.00
Depreciation	0.00	12.00	0.00	40.00
Taxes and insurance	0.00	0.00	0.00	20.00
Selling expenses	0.00	0.00	0.00	200.00
Total overhead cost	$16.85	$320.00	$89.00	$1,090.00

Required:

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1. Using Exhibit 7A-3 as a guide, prepare a report showing the overhead cost of the order for heavy-duty trailer axles discussed in Exercise 7-9. What is the total overhead cost of the order according to the activity-based costing system?
2. Explain the two different perspectives this report gives to managers concerning the nature of the overhead costs involved in the order. (*Hint:* Look at the row and column totals of the report you have prepared.)

EXERCISE 7A-3 Second-Stage Allocations and Margin Calculations Using the Action Analysis Approach [LO7-4, LO7-6]

Refer to the data for Foam Products, Inc., in Exercise 7-11 and the following additional details concerning the activity rates in the activity-based costing system:

	Activity Rates			
	Supporting Direct Labor	Batch Processing	Order Processing	Customer Service
Manufacturing overhead:				
Indirect labor	$0.60	$ 60.00	$ 20.00	$ 0.00
Factory equipment depreciation	4.00	17.00	0.00	0.00
Factory administration	0.10	7.00	25.00	150.00
Selling and administrative overhead:				
Wages and salaries	0.40	20.00	160.00	1,600.00
Depreciation	0.00	3.00	10.00	38.00
Marketing expenses	0.45	0.00	60.00	675.00
Total	$5.55	$107.00	$275.00	$2,463.00

Management has provided its ease of adjustment codes for the purpose of preparing action analyses.

	Ease of Adjustment Codes
Direct materials	Green
Direct labor	Yellow
Manufacturing overhead:	
Indirect labor	Yellow
Factory equipment depreciation	Red
Factory administration	Red
Selling and administrative overhead:	
Wages and salaries	Red
Depreciation	Red
Marketing expenses	Yellow

Required:

Using Exhibit 7A-5 as a guide, prepare an action analysis report for Interstate Trucking similar to those prepared for products.

EXERCISE 7A-4 Comprehensive Activity-Based Costing Exercise [LO7-2, LO7-3, LO7-4, LO7-6]

Refer to the data for Advanced Products Corporation in Exercise 7-15.

Required:

1. Using Exhibit 7A-1 as a guide, prepare a report showing the first-stage allocations of overhead costs to the activity cost pools.
2. Using Exhibit 7A-2 as a guide, compute the activity rates for the activity cost pools.
3. Using Exhibit 7A-3 as a guide, prepare a report showing the overhead costs for the order from Shenzhen Enterprises including customer support costs.
4. Using Exhibit 7-12 as a guide, prepare a report showing the customer margin for Shenzhen Enterprises.