5 Activity-Based Costing and Activity-Based Management

Learning Objectives

1. Explain how broad averaging undercosts and overcosts products or services
2. Present three guidelines for refining a costing system
3. Distinguish between simple and activity-based costing systems
4. Describe a four-part cost hierarchy
5. Cost products or services using activity-based costing
6. Evaluate the costs and benefits of implementing activity-based costing systems
7. Explain how activity-based costing systems are used in activity-based management
8. Compare activity-based costing systems and department costing systems

A good mystery never fails to capture the imagination.

Money is stolen or lost, property disappears, or someone meets with foul play. On the surface, what appears unremarkable to the untrained eye can turn out to be quite a revelation once the facts and details are uncovered. Getting to the bottom of the case, understanding what happened and why, and taking action can make the difference between a solved case and an unsolved one. Business and organizations are much the same. Their costing systems are often mysteries with unresolved questions: Why are we bleeding red ink? Are we pricing our products accurately? Activity-based costing can help unravel the mystery and result in improved operations, as LG Electronics discovers in the following article.

LG Electronics Reduces Costs and Inefficiencies Through Activity-Based Costing[1]

LG Electronics is one of the world's largest manufacturers of flat-screen televisions and mobile phones. In 2009, the Seoul, South Korea-based company sold 16 million liquid crystal display televisions and 117 million mobile phones worldwide.

To make so many electronic devices, LG Electronics spends nearly $40 billion annually on the procurement of semiconductors, metals, connectors, and other materials. Costs for many of these components have soared in recent years. Until 2008, however, LG Electronics did not have a centralized procurement system to leverage its scale and to control supply costs. Instead, the company had a decentralized system riddled with wasteful spending and inefficiencies.

To respond to these challenges, LG Electronics hired its first chief procurement officer who turned to activity-based costing ("ABC") for answers. ABC analysis of the company's procurement system revealed that most company resources were applied to administrative and not strategic tasks. Furthermore, the administrative tasks were done manually and at a very high cost.

The ABC analysis led LG Electronics to change many of its procurement practices and processes, improve efficiency and focus

[1] *Sources:* Carbone, James. 2009. LG Electronics centralizes purchasing to save. *Purchasing*, April. http://www.purchasing.com/article/217108-LG_Electronics_centralizes_purchasing_to_save.php; Linton's goals. 2009. Supply Management, May 12. http://www.supplymanagement.com/analysis/features/2009/lintons-goals/; Yoou-chul, Kim. 2009. CPO expects to save $1 billion in procurement. *The Korea Times*, April 1. http://www.koreatimes.co.kr/www/news/biz/2009/04/123_42360.html

on the highest-value tasks such as managing costs of commodity products and negotiating with suppliers. Furthermore, the company developed a global procurement strategy for its televisions, mobile phones, computers, and home theatre systems by implementing competitive bidding among suppliers, standardizing parts across product lines, and developing additional buying capacity in China.

The results so far have been staggering. In 2008 alone, LG Electronics reduced its materials costs by 16%, and expects to further reduce costs by $5 billion by the end of 2011.

Most companies—such as Dell, Oracle, JP Morgan Chase, and Honda—offer more than one product (or service). Dell Computer, for example, produces desktops, laptops, and servers. The three basic activities for manufacturing computers are (a) designing computers, (b) ordering component parts, and (c) assembly. The different products, however, require different quantities of the three activities. For example, a server has a more complex design, many more parts, and a more complex assembly than a desktop.

To measure the cost of producing each product, Dell separately tracks activity costs for each product. In this chapter, we describe activity-based costing systems and how they help companies make better decisions about pricing and product mix. And, just as in the case of LG Electronics, we show how ABC systems assist in cost management decisions by improving product designs, processes, and efficiency.

Broad Averaging and Its Consequences

Learning Objective 1

Explain how broad averaging undercosts and overcosts products or services

. . . this problem arises when reported costs of products do not equal their actual costs

Historically, companies (such as television and automobile manufacturers) produced a limited variety of products. Indirect (or overhead) costs were a relatively small percentage of total costs. Using simple costing systems to allocate costs broadly was easy, inexpensive, and reasonably accurate. However, as product diversity and indirect costs have increased, broad averaging has resulted in greater inaccuracy of product costs. For example, the use of a single, plant-wide manufacturing overhead rate to allocate costs to products often produces unreliable cost data. The term *peanut-butter costing* (yes, that's what it's called) describes a particular costing approach that uses broad averages for assigning (or spreading, as in spreading peanut butter) the cost of resources uniformly to cost

objects (such as products or services) when the individual products or services, may in fact, use those resources in nonuniform ways.

Undercosting and Overcosting

The following example illustrates how averaging can result in inaccurate and misleading cost data. Consider the cost of a restaurant bill for four colleagues who meet monthly to discuss business developments. Each diner orders separate entrees, desserts, and drinks. The restaurant bill for the most recent meeting is as follows:

	Emma	James	Jessica	Matthew	Total	Average
Entree	$11	$20	$15	$14	$ 60	$15
Dessert	0	8	4	4	16	4
Drinks	4	14	8	6	32	8
Total	$15	$42	$27	$24	$108	$27

If the $108 total restaurant bill is divided evenly, $27 is the average cost per diner. This cost-averaging approach treats each diner the same. Emma would probably object to paying $27 because her actual cost is only $15; she ordered the lowest-cost entree, had no dessert, and had the lowest-cost drink. When costs are averaged across all four diners, both Emma and Matthew are overcosted, James is undercosted, and Jessica is (by coincidence) accurately costed.

Broad averaging can lead to undercosting or overcosting of products or services:

- **Product undercosting**—a product consumes a high level of resources but is reported to have a low cost per unit (James's dinner).
- **Product overcosting**—a product consumes a low level of resources but is reported to have a high cost per unit (Emma's dinner).

What are the strategic consequences of product undercosting and overcosting? Think of a company that uses cost information about its products to guide pricing decisions. Undercosted products will be underpriced and may even lead to sales that actually result in losses—sales bring in less revenue than the cost of resources they use. Overcosted products lead to overpricing, causing these products to lose market share to competitors producing similar products. Worse still, product undercosting and overcosting causes managers to focus on the wrong products, drawing attention to overcosted products whose costs may in fact be perfectly reasonable and ignoring undercosted products that in fact consume large amounts of resources.

Product-Cost Cross-Subsidization

Product-cost cross-subsidization means that if a company undercosts one of its products, it will overcost at least one of its other products. Similarly, if a company overcosts one of its products, it will undercost at least one of its other products. Product-cost cross-subsidization is very common in situations in which a cost is uniformly spread—meaning it is broadly averaged—across multiple products without recognizing the amount of resources consumed by each product.

In the restaurant-bill example, the amount of cost cross-subsidization of each diner can be readily computed *because all cost items can be traced as direct costs to each diner*. If all diners pay $27, Emma is paying $12 more than her actual cost of $15. She is cross-subsidizing James who is paying $15 less than his actual cost of $42. Calculating the amount of cost cross-subsidization takes more work when there are indirect costs to be considered. Why? Because when the resources represented by indirect costs are used by two or more diners, we need to find a way to allocate costs to each diner. Consider, for example, a $40 bottle of wine whose cost is shared equally. Each diner would pay $10 ($40 ÷ 4). Suppose Matthew drinks 2 glasses of wine while Emma, James, and Jessica drink one glass each for a total of 5 glasses. Allocating the cost of the bottle of wine on the basis of the glasses of wine that each diner drinks would result in Matthew paying $16 ($40 × 2/5) and

each of the others \$8 (\$40 × 1/5). In this case, by sharing the cost equally, Emma, James, and Jessica are each paying \$2 (\$10 – \$8) more and are cross-subsidizing Matthew who is paying \$6 (\$16 – \$10) less for the wine he consumes.

To see the effects of broad averaging on direct and indirect costs, we consider Plastim Corporation's costing system.

Decision Point

When does product undercosting or overcosting occur?

Simple Costing System at Plastim Corporation

Plastim Corporation manufactures lenses for the rear taillights of automobiles. A lens, made from black, red, orange, or white plastic, is the part of the lamp visible on the automobile's exterior. Lenses are made by injecting molten plastic into a mold to give the lamp its desired shape. The mold is cooled to allow the molten plastic to solidify, and the lens is removed.

Under its contract with Giovanni Motors, a major automobile manufacturer, Plastim makes two types of lenses: a complex lens, CL5, and a simple lens, S3. The complex lens is a large lens with special features, such as multicolor molding (when more than one color is injected into the mold) and a complex shape that wraps around the corner of the car. Manufacturing CL5 lenses is more complex because various parts in the mold must align and fit precisely. The S3 lens is simpler to make because it has a single color and few special features.

Design, Manufacturing, and Distribution Processes

The sequence of steps to design, produce, and distribute lenses, whether simple or complex, is as follows:

- **Design products and processes.** Each year Giovanni Motors specifies some modifications to the simple and complex lenses. Plastim's design department designs the molds from which the lenses will be made and specifies the processes needed (that is, details of the manufacturing operations).
- **Manufacture lenses.** The lenses are molded, finished, cleaned, and inspected.
- **Distribute lenses.** Finished lenses are packed and sent to Giovanni Motors.

Plastim is operating at capacity and incurs very low marketing costs. Because of its high-quality products, Plastim has minimal customer-service costs. Plastim's business environment is very competitive with respect to simple lenses. At a recent meeting, Giovanni's purchasing manager indicated that a new supplier, Bandix, which makes only simple lenses, is offering to supply the S3 lens to Giovanni at a price of \$53, well below the \$63 price that Plastim is currently projecting and budgeting for 2011. Unless Plastim can lower its selling price, it will lose the Giovanni business for the simple lens for the upcoming model year. Fortunately, the same competitive pressures do not exist for the complex lens, which Plastim currently sells to Giovanni at \$137 per lens.

Plastim's management has two primary options:

- Plastim can give up the Giovanni business in simple lenses if selling simple lenses is unprofitable. Bandix makes only simple lenses and perhaps, therefore, uses simpler technology and processes than Plastim. The simpler operations may give Bandix a cost advantage that Plastim cannot match. If so, it is better for Plastim to not supply the S3 lens to Giovanni.
- Plastim can reduce the price of the simple lens and either accept a lower margin or aggressively seek to reduce costs.

To make these long-run strategic decisions, management needs to first understand the costs to design, make, and distribute the S3 and CL5 lenses.

While Bandix makes only simple lenses and can fairly accurately calculate the cost of a lens by dividing total costs by units produced, Plastim's costing environment is more challenging. The processes to make both simple and complex lenses are more complicated than the processes required to make only simple lenses. Plastim needs to find a way to allocate costs to each type of lens.

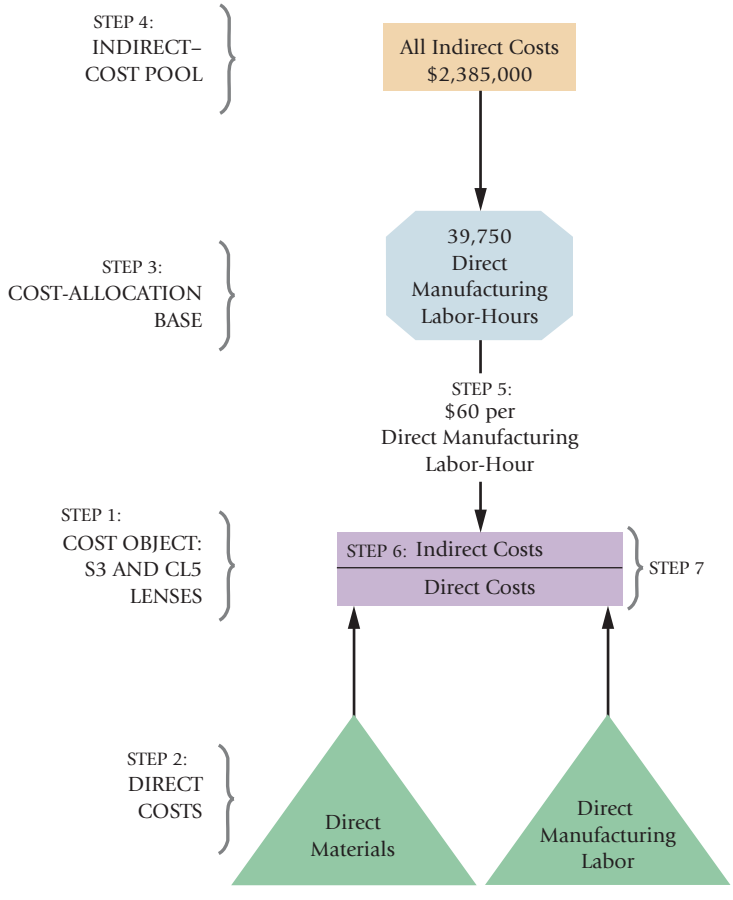
In computing costs, Plastim assigns both variable costs and costs that are fixed in the short run to the S3 and CL5 lenses. Managers cost products and services to guide long-run strategic decisions (for example, what mix of products and services to produce and sell and what prices to charge for them). In the long-run, managers want revenues to exceed total costs (variable and fixed) to design, make, and distribute the lenses.

To guide their pricing and cost-management decisions, Plastim's managers assign all costs, both manufacturing and nonmanufacturing, to the S3 and CL5 lenses. If managers had wanted to calculate the cost of inventory, Plastim's management accountants would have assigned only manufacturing costs to the lenses, as required by generally accepted accounting principles. Surveys of company practice across the globe overwhelmingly indicate that the vast majority of companies use costing systems not just for inventory costing but also for strategic purposes such as pricing and product-mix decisions and decisions about cost reduction, process improvement, design, and planning and budgeting. As a result, even merchandising-sector companies (for whom inventory costing is straightforward) and service-sector companies (who have no inventory) expend considerable resources in designing and operating their costing systems. In this chapter, we take this more strategic focus and allocate costs in all functions of the value chain to the S3 and CL5 lenses.

Simple Costing System Using a Single Indirect-Cost Pool

Plastim has historically had a simple costing system that allocates indirect costs using a single indirect-cost rate, the type of system described in Chapter 4. We calculate budgeted costs for each type of lens in 2011 using Plastim's simple costing system and later contrast it with activity-based costing. (Note that instead of jobs, as in Chapter 4, we now have products as the cost objects.) Exhibit 5-1 shows an overview of Plastim's simple costing system. Use this exhibit as a guide as you study the following steps, each of which is marked in Exhibit 5-1.

Exhibit 5-1
Overview of Plastim's Simple Costing System



Step 1: Identify the Products That Are the Chosen Cost Objects. The cost objects are the 60,000 simple S3 lenses and the 15,000 complex CL5 lenses that Plastim will produce in 2011. Plastim's goal is to first calculate the total costs and then the unit cost of designing, manufacturing, and distributing these lenses.

Step 2: Identify the Direct Costs of the Products. Plastim identifies the direct costs—direct materials and direct manufacturing labor—of the lenses. Exhibit 5-2 shows the direct and indirect costs for the S3 and the CL5 lenses using the simple costing system. The direct cost calculations appear on lines 5, 6, and 7 of Exhibit 5-2. Plastim classifies all other costs as indirect costs.

Step 3: Select the Cost-Allocation Bases to Use for Allocating Indirect (or Overhead) Costs to the Products. A majority of the indirect costs consist of salaries paid to supervisors, engineers, manufacturing support, and maintenance staff, all supporting direct manufacturing labor. Plastim uses direct manufacturing labor-hours as the only allocation base to allocate all manufacturing and nonmanufacturing indirect costs to S3 and CL5. In 2011, Plastim plans to use 39,750 direct manufacturing labor-hours.

Step 4: Identify the Indirect Costs Associated with Each Cost-Allocation Base. Because Plastim uses only a single cost-allocation base, Plastim groups all budgeted indirect costs of $2,385,000 for 2011 into a single overhead cost pool.

Step 5: Compute the Rate per Unit of Each Cost-Allocation Base.

$$\text{Budgeted indirect-cost rate} = \frac{\text{Budgeted total costs in indirect-cost pool}}{\text{Budgeted total quantity of cost-allocation base}}$$

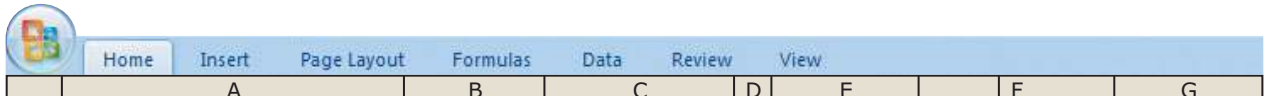
$$= \frac{\$2{,}385{,}000}{39{,}750 \text{ direct manufacturing labor-hours}}$$

$$= \$60 \text{ per direct manufacturing labor-hour}$$

Step 6: Compute the Indirect Costs Allocated to the Products. Plastim expects to use 30,000 total direct manufacturing labor-hours to make the 60,000 S3 lenses and 9,750 total direct manufacturing labor-hours to make the 15,000 CL5 lenses. Exhibit 5-2 shows indirect costs of $1,800,000 ($60 per direct manufacturing labor-hour × 30,000 direct manufacturing labor-hours) allocated to the simple lens and $585,000 ($60 per direct manufacturing labor-hour × 9,750 direct manufacturing labor-hours) allocated to the complex lens.

Step 7: Compute the Total Cost of the Products by Adding All Direct and Indirect Costs Assigned to the Products. Exhibit 5-2 presents the product costs for the simple and complex lenses. The direct costs are calculated in Step 2 and the indirect costs in Step 6. Be sure you see the parallel between the simple costing system overview diagram (Exhibit 5-1)

Exhibit 5-2 Plastim's Product Costs Using the Simple Costing System



	A	B	C	D	E	F	G
1		60,000			15,000		
2		Simple Lenses (S3)			Complex Lenses (CL5)		
3		Total	per Unit		Total	per Unit	Total
4		(1)	(2) = (1) ÷ 60,000		(3)	(4) = (3) ÷ 15,000	(5) = (1) + (3)
5	Direct materials	$1,125,000	$18.75		$ 675,000	$45.00	$1,800,000
6	Direct manufacturing labor	600,000	10.00		195,000	13.00	795,000
7	Total direct costs (Step 2)	1,725,000	28.75		870,000	58.00	2,595,000
8	Indirect costs allocated (Step 6)	1,800,000	30.00		585,000	39.00	2,385,000
9	Total costs (Step 7)	$3,525,000	$58.75		$1,455,000	$97.00	$4,980,000
10							

and the costs calculated in Step 7. Exhibit 5-1 shows two direct-cost categories and one indirect-cost category. Hence, the budgeted cost of each type of lens in Step 7 (Exhibit 5-2) has three line items: two for direct costs and one for allocated indirect costs. The budgeted cost per S3 lens is $58.75, well above the $53 selling price quoted by Bandix. The budgeted cost per CL5 lens is $97.

Applying the Five-Step Decision-Making Process at Plastim

To decide how it should respond to the threat that Bandix poses to its S3 lens business, Plastim's management works through the five-step decision-making process introduced in Chapter 1.

Step 1: Identify the problem and uncertainties. The problem is clear: If Plastim wants to retain the Giovanni business for S3 lenses and make a profit, it must find a way to reduce the price and costs of the S3 lens. The two major uncertainties Plastim faces are (1) whether Plastim's technology and processes for the S3 lens are competitive with Bandix's and (2) whether the S3 lens is overcosted by the simple costing system.

Step 2: Obtain information. Management asks a team of its design and process engineers to analyze and evaluate the design, manufacturing, and distribution operations for the S3 lens. The team is very confident that the technology and processes for the S3 lens are not inferior to those of Bandix and other competitors because Plastim has many years of experience in manufacturing and distributing the S3 with a history and culture of continuous process improvements. If anything, the team is less certain about Plastim's capabilities in manufacturing and distributing complex lenses, because it only recently started making this type of lens. Given these doubts, management is happy that Giovanni Motors considers the price of the CL5 lens to be competitive. It is somewhat of a puzzle, though, how at the currently budgeted prices, Plastim is expected to earn a very large profit margin percentage (operating income ÷ revenues) on the CL5 lenses and a small profit margin on the S3 lenses:

	60,000 Simple Lenses (S3)		15,000 Complex Lenses (CL5)		
	Total (1)	per Unit (2) = (1) ÷ 60,000	Total (3)	per Unit (4) = (3) ÷ 15,000	Total (5) = (1) + (3)
Revenues	$3,780,000	$63.00	$2,055,000	$137.00	$5,835,000
Total costs	3,525,000	58.75	1,455,000	97.00	4,980,000
Operating income	$ 255,000	$ 4.25	$ 600,000	$ 40.00	$ 855,000
Profit margin percentage		6.75%		29.20%	

As it continues to gather information, Plastim's management begins to ponder why the profit margins (and process) are under so much pressure for the S3 lens, where the company has strong capabilities, but high on the newer, less-established CL5 lens. Plastim is not deliberately charging a low price for S3, so management starts to believe that perhaps the problem lies with its costing system. Plastim's simple costing system may be overcosting the simple S3 lens (assigning too much cost to it) and undercosting the complex CL5 lens (assigning too little cost to it).

Step 3: Make predictions about the future. Plastim's key challenge is to get a better estimate of what it will cost to design, make, and distribute the S3 and CL5 lenses. Management is fairly confident about the direct material and direct manufacturing labor costs of each lens because these costs are easily traced to the lenses. But management is quite concerned about how accurately the simple costing system measures the indirect resources used by each type of lens. It believes it can do much better.

At the same time, management wants to ensure that no biases enter its thinking. In particular, it wants to be careful that the desire to be competitive on the S3 lens should not lead to assumptions that bias in favor of lowering costs of the S3 lens.

Step 4: Make decisions by choosing among alternatives. On the basis of predicted costs, and taking into account how Bandix might respond, Plastim's managers must decide whether they should bid for Giovanni Motors' S3 lens business and if they do bid, what price they should offer.

Step 5: Implement the decision, evaluate performance, and learn. If Plastim bids and wins Giovanni's S3 lens business, it must compare actual costs, as it makes and ships S3 lenses, to predicted costs and learn why actual costs deviate from predicted costs. Such evaluation and learning form the basis for future improvements.

The next few sections focus on Steps 3, 4, and 5—how Plastim improves the allocation of indirect costs to the S3 and CL5 lenses, how it uses these predictions to bid for the S3 lens business, and how it makes product design and process improvements.

Refining a Costing System

A **refined costing system** reduces the use of broad averages for assigning the cost of resources to cost objects (such as jobs, products, and services) and provides better measurement of the costs of indirect resources used by different cost objects—no matter how differently various cost objects use indirect resources.

Learning Objective 2

Present three guidelines for refining a costing system

. . . classify more costs as direct costs, expand the number of indirect-cost pools, and identify cost drivers

Reasons for Refining a Costing System

There are three principal reasons that have accelerated the demand for such refinements.

1. **Increase in product diversity.** The growing demand for customized products has led companies to increase the variety of products and services they offer. Kanthal, the Swedish manufacturer of heating elements, for example, produces more than 10,000 different types of electrical heating wires and thermostats. Banks, such as the Cooperative Bank in the United Kingdom, offer many different types of accounts and services: special passbook accounts, ATMs, credit cards, and electronic banking. These products differ in the demands they place on the resources needed to produce them, because of differences in volume, process, and complexity. The use of broad averages is likely to lead to distorted and inaccurate cost information.
2. **Increase in indirect costs.** The use of product and process technology such as computer-integrated manufacturing (CIM) and flexible manufacturing systems (FMS), has led to an increase in indirect costs and a decrease in direct costs, particularly direct manufacturing labor costs. In CIM and FMS, computers on the manufacturing floor give instructions to set up and run equipment quickly and automatically. The computers accurately measure hundreds of production parameters and directly control the manufacturing processes to achieve high-quality output. Managing more complex technology and producing very diverse products also requires committing an increasing amount of resources for various support functions, such as production scheduling, product and process design, and engineering. Because direct manufacturing labor is not a cost driver of these costs, allocating indirect costs on the basis of direct manufacturing labor (which was the common practice) does not accurately measure how resources are being used by different products.
3. **Competition in product markets.** As markets have become more competitive, managers have felt the need to obtain more accurate cost information to help them make important strategic decisions, such as how to price products and which products to sell. Making correct pricing and product mix decisions is critical in competitive markets because competitors quickly capitalize on a company's mistakes.

   Whereas the preceding factors point to reasons for the increase in *demand* for refined cost systems, *advances in information technology* have enabled companies to implement these refinements. Costing system refinements require more data gathering and more analysis, and improvements in information technology have drastically reduced the costs to gather, validate, store, and analyze vast quantities of data.

Guidelines for Refining a Costing System

There are three main guidelines for refining a costing system. In the following sections, we delve more deeply into each in the context of the Plastim example.

1. **Direct-cost tracing.** Identify as many direct costs as is economically feasible. This guideline aims to reduce the amount of costs classified as indirect, thereby minimizing the extent to which costs have to be allocated, rather than traced.
2. **Indirect-cost pools.** Expand the number of indirect-cost pools until each pool is more homogeneous. All costs in a *homogeneous cost pool* have the same or a similar cause-and-effect (or benefits-received) relationship with a single cost driver that is used as the cost-allocation base. Consider, for example, a single indirect-cost pool containing both indirect machining costs and indirect distribution costs that are allocated to products using machine-hours. This pool is not homogeneous because machine-hours are a cost driver of machining costs but not of distribution costs, which has a different cost driver, number of shipments. If, instead, machining costs and distribution costs are separated into two indirect-cost pools (with machine-hours as the cost-allocation base for the machining cost pool and number of shipments as the cost-allocation base for the distribution cost pool), each indirect-cost pool would become homogeneous.
3. **Cost-allocation bases.** As we describe later in the chapter, whenever possible, use the cost driver (the cause of indirect costs) as the cost-allocation base for each homogenous indirect-cost pool (the effect).

Decision Point

How do managers refine a costing system?

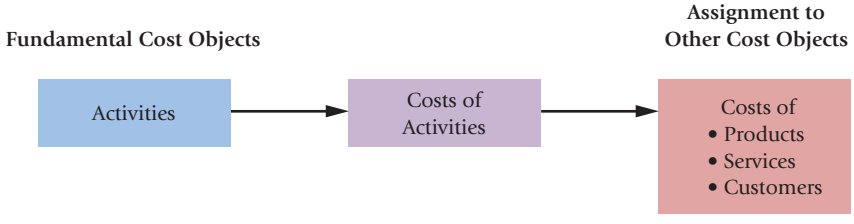
Activity-Based Costing Systems

Learning Objective 3

Distinguish between simple and activity-based costing systems

. . . unlike simple systems, ABC systems calculate costs of individual activities to cost products

One of the best tools for refining a costing system is activity-based costing. **Activity-based costing** (**ABC**) refines a costing system by identifying individual activities as the fundamental cost objects. An **activity** is an event, task, or unit of work with a specified purpose—for example, designing products, setting up machines, operating machines, and distributing products. More informally, activities are verbs; they are things that a firm does. To help make strategic decisions, ABC systems identify activities in all functions of the value chain, calculate costs of individual activities, and assign costs to cost objects such as products and services on the basis of the mix of activities needed to produce each product or service.[2]



Plastim's ABC System

After reviewing its simple costing system and the potential miscosting of product costs, Plastim decides to implement an ABC system. Direct material costs and direct manufacturing labor costs can be traced to products easily, so the ABC system focuses on refining the assignment of indirect costs to departments, processes, products, or other cost objects. Plastim's ABC system identifies various activities that help explain why Plastim incurs the costs it currently classifies as indirect in its simple costing system. In other words, it breaks up the current indirect cost pool into finer pools of costs related to various activities. To identify these activities, Plastim organizes a team comprised of managers from design, manufacturing, distribution, accounting, and administration.

[2] For more details on ABC systems, see R. Cooper and R. S. Kaplan, *The Design of Cost Management Systems* (Upper Saddle River, NJ: Prentice Hall, 1999); G. Cokins, *Activity-Based Cost Management: An Executive's Guide* (Hoboken, NJ: John Wiley & Sons, 2001); and R. S. Kaplan and S. Anderson, *Time-Driven Activity-Based Costing: A Simpler and More Powerful Path to Higher Profits* (Boston: Harvard Business School Press, 2007).

Defining activities is not a simple matter. The team evaluates hundreds of tasks performed at Plastim before choosing the activities that form the basis of its ABC system. For example, it decides if maintenance of molding machines, operations of molding machines, and process control should each be regarded as a separate activity or should be combined into a single activity. An activity-based costing system with many activities becomes overly detailed and unwieldy to operate. An activity-based costing system with too few activities may not be refined enough to measure cause-and-effect relationships between cost drivers and various indirect costs. Plastim's team focuses on activities that account for a sizable fraction of indirect costs and combines activities that have the same cost driver into a single activity. For example, the team decides to combine maintenance of molding machines, operations of molding machines, and process control into a single activity—molding machine operations—because all these activities have the same cost driver: molding machine-hours.

The team identifies the following seven activities by developing a flowchart of all the steps and processes needed to design, manufacture, and distribute S3 and CL5 lenses.

a. Design products and processes
b. Set up molding machines to ensure that the molds are properly held in place and parts are properly aligned before manufacturing starts
c. Operate molding machines to manufacture lenses
d. Clean and maintain the molds after lenses are manufactured
e. Prepare batches of finished lenses for shipment
f. Distribute lenses to customers
g. Administer and manage all processes at Plastim

These activity descriptions form the basis of the activity-based costing system—sometimes called an *activity list* or *activity dictionary*. Compiling the list of tasks, however, is only the first step in implementing activity-based costing systems. Plastim must also identify the cost of each activity and the related cost driver. To do so, Plastim uses the three guidelines for refining a costing system described on page 146.

1. **Direct-cost tracing.** Plastim's ABC system subdivides the single indirect cost pool into seven smaller cost pools related to the different activities. The costs in the cleaning and maintenance activity cost pool (item d) consist of salaries and wages paid to workers who clean the mold. These costs are direct costs, because they can be economically traced to a specific mold and lens.
2. **Indirect-cost pools.** The remaining six activity cost pools are indirect cost pools. Unlike the single indirect cost pool of Plastim's simple costing system, each of the activity-related cost pools is homogeneous. That is, each activity cost pool includes only those narrow and focused set of costs that have the same cost driver. For example, the distribution cost pool includes only those costs (such as wages of truck drivers) that, over time, increase as the cost driver of distribution costs, cubic feet of packages delivered, increases. In the simple costing system, all indirect costs were lumped together and the cost-allocation base, direct manufacturing labor-hours, was not a cost driver of the indirect costs.

   Determining costs of activity pools requires assigning and reassigning costs accumulated in support departments, such as human resources and information systems, to each of the activity cost pools on the basis of how various activities use support department resources. This is commonly referred to as *first-stage allocation*, a topic which we discuss in detail in Chapters 14 and 15. We focus here on the *second-stage allocation*, the allocation of costs of activity cost pools to products.
3. **Cost-allocation bases.** For each activity cost pool, the cost driver is used (whenever possible) as the cost-allocation base. To identify cost drivers, Plastim's managers consider various alternatives and use their knowledge of operations to choose among them. For example, Plastim's managers choose setup-hours rather than the number of setups as the cost driver of setup costs, because Plastim's managers believe that more complex setups take more time and are more costly. Over time, Plastim's managers can use data to test their beliefs. (Chapter 10 discusses several methods to estimate the relationship between a cost driver and costs.)

The logic of ABC systems is twofold. First, structuring activity cost pools more finely with cost drivers for each activity cost pool as the cost-allocation base leads to more accurate costing of activities. Second, allocating these costs to products by measuring the cost-allocation bases of different activities used by different products leads to more accurate product costs. We illustrate this logic by focusing on the setup activity at Plastim.

Setting up molding machines frequently entails trial runs, fine-tuning, and adjustments. Improper setups cause quality problems such as scratches on the surface of the lens. The resources needed for each setup depend on the complexity of the manufacturing operation. Complex lenses require more setup resources (setup-hours) per setup than simple lenses. Furthermore, complex lenses can be produced only in small batches because the molds for complex lenses need to be cleaned more often than molds for simple lenses. Thus, relative to simple lenses, complex lenses not only use more setup-hours per setup, but they also require more frequent setups.

Setup data for the simple S3 lens and the complex CL5 lens are as follows:

		Simple S3 Lens	Complex CL5 Lens	Total
1	Quantity of lenses produced	60,000	15,000	
2	Number of lenses produced per batch	240	50	
3 = (1) ÷ (2)	Number of batches	250	300	
4	Setup time per batch	2 hours	5 hours	
5 = (3) × (4)	Total setup-hours	500 hours	1,500 hours	2,000 hours

Of the $2,385,000 in the total indirect-cost pool, Plastim identifies the total costs of setups (consisting mainly of depreciation on setup equipment and allocated costs of process engineers, quality engineers, and supervisors) to be $300,000. Recall that in its simple costing system, Plastim uses direct manufacturing labor-hours to allocate all indirect costs to products. The following table compares how setup costs allocated to simple and complex lenses will be different if Plastim allocates setup costs to lenses based on setup-hours rather than direct manufacturing labor-hours. Of the $60 total rate per direct manufacturing labor-hour (p. 143), the setup cost per direct manufacturing labor-hour amounts to $7.54717 ($300,000 ÷ 39,750 total direct manufacturing labor-hours). The setup cost per setup-hour equals $150 ($300,000 ÷ 2,000 total setup-hours).

	Simple S3 Lens	Complex CL5 Lens	Total
Setup cost allocated using direct manufacturing labor-hours:			
$7.54717 × 30,000; $7.54717 × 9,750	$226,415	$ 73,585	$300,000
Setup cost allocated using setup-hours:			
$150 × 500; $150 × 1,500	$ 75,000	$225,000	$300,000

As we have already discussed when presenting guidelines 2 and 3, setup-hours, not direct manufacturing labor-hours, are the cost driver of setup costs.. The CL5 lens uses substantially more setup-hours than the S3 lens (1,500 hours ÷ 2,000 hours = 75% of the total setup-hours) because the CL5 requires a greater number of setups (batches) and each setup is more challenging and requires more setup-hours.

The ABC system therefore allocates substantially more setup costs to CL5 than to S3. When direct manufacturing labor-hours rather than setup-hours are used to allocate setup costs in the simple costing system, it is the S3 lens that is allocated a very large share of the setup costs because the S3 lens uses a larger proportion of direct manufacturing labor-hours (30,000 ÷ 39,750 = 75.47%). As a result, the simple costing system overcosts the S3 lens with regard to setup costs.

Decision Point

What is the difference between the design of a simple costing system and an activity-based costing (ABC) system?

Note that setup-hours are related to batches (or groups) of lenses made, not the number of individual lenses. Activity-based costing attempts to identify the most relevant cause-and-effect relationship for each activity pool, without restricting the cost driver to only units of output or variables related to units of output (such as direct manufacturing labor-hours). As our discussion of setups illustrates, limiting cost-allocation bases in this manner weakens the cause-and-effect relationship between the cost-allocation base and the costs in a cost pool.

Cost Hierarchies

Learning Objective 4

Describe a four-part cost hierarchy

. . . a four-part cost hierarchy is used to categorize costs based on different types of cost drivers—for example, costs that vary with each unit of a product versus costs that vary with each batch of products

A **cost hierarchy** categorizes various activity cost pools on the basis of the different types of cost drivers, or cost-allocation bases, or different degrees of difficulty in determining cause-and-effect (or benefits-received) relationships. ABC systems commonly use a cost hierarchy with four levels—output unit-level costs, batch-level costs, product-sustaining costs, and facility-sustaining costs—to identify cost-allocation bases that are cost drivers of the activity cost pools.

Output unit-level costs are the costs of activities performed on each individual unit of a product or service. Machine operations costs (such as the cost of energy, machine depreciation, and repair) related to the activity of running the automated molding machines are output unit-level costs. They are output unit-level costs because, over time, the cost of this activity increases with additional units of output produced (or machine-hours used). Plastim's ABC system uses molding machine-hours—an output-unit level cost-allocation base—to allocate machine operations costs to products.

Batch-level costs are the costs of activities related to a group of units of a product or service rather than each individual unit of product or service. In the Plastim example, setup costs are batch-level costs because, over time, the cost of this setup activity increases with setup-hours needed to produce batches (groups) of lenses. As described in the table on page 148, the S3 lens requires 500 setup-hours (2 setup-hours per batch × 250 batches). The CL5 lens requires 1,500 setup-hours (5 setup-hours per batch × 300 batches). The total setup costs allocated to S3 and CL5 depend on the total setup-hours required by each type of lens, not on the number of units of S3 and CL5 produced. (Setup costs being a batch-level cost cannot be avoided by producing one less unit of S3 or CL5.) Plastim's ABC system uses setup-hours—a batch-level cost-allocation base—to allocate setup costs to products. Other examples of batch-level costs are material-handling and quality-inspection costs associated with batches (not the quantities) of products produced, and costs of placing purchase orders, receiving materials, and paying invoices related to the number of purchase orders placed rather than the quantity or value of materials purchased.

Product-sustaining costs (**service-sustaining costs**) are the costs of activities undertaken to support individual products or services regardless of the number of units or batches in which the units are produced. In the Plastim example, design costs are product-sustaining costs. Over time, design costs depend largely on the time designers spend on designing and modifying the product, the mold, and the process. These design costs are a function of the complexity of the mold, measured by the number of parts in the mold multiplied by the area (in square feet) over which the molten plastic must flow (12 parts × 2.5 square feet, or 30 parts-square feet for the S3 lens, and 14 parts × 5 square feet, or 70 parts-square feet for the CL5 lens). As a result, the total design costs allocated to S3 and CL5 depend on the complexity of the mold, regardless of the number of units or batches of production. Design costs cannot be avoided by producing fewer units or running fewer batches. Plastim's ABC system uses parts-square feet—a product-sustaining cost-allocation base—to allocate design costs to products. Other examples of product-sustaining costs are product research and development costs, costs of making engineering changes, and marketing costs to launch new products.

Facility-sustaining costs are the costs of activities that cannot be traced to individual products or services but that support the organization as a whole. In the Plastim example, the general administration costs (including top management compensation, rent, and building security) are facility-sustaining costs. It is usually difficult to find a good cause-and-effect relationship between these costs and the cost-allocation base. This lack of a cause-and-effect relationship causes some companies not to allocate these costs to products and instead to deduct them as a separate lump-sum amount from operating income. Other companies, such as Plastim, allocate facility-sustaining costs to products on some basis—for example, direct manufacturing labor-hours—because management believes all costs should be allocated to products. Allocating all costs to products or services becomes important when management wants to set selling prices on the basis of an amount of cost that includes all costs.

Decision Point

What is a cost hierarchy?

Implementing Activity-Based Costing

Learning Objective 5

Cost products or services using activity-based costing

. . . use cost rates for different activities to compute indirect costs of a product

Now that you understand the basic concepts of ABC, let's use it to refine Plastim's simple costing system, compare it to alternative costing systems, and examine what managers look for when deciding whether or not to develop ABC systems.

Implementing ABC at Plastim

In order to apply ABC to Plastim's costing system, we follow the seven-step approach to costing and the three guidelines for refining costing systems (increasing direct-cost tracing, creating homogeneous indirect-cost pools, and identifying cost-allocation bases that have cause-and-effect relationships with costs in the cost pool). Exhibit 5-3 shows an overview of Plastim's ABC system. Use this exhibit as a guide as you study the following steps, each of which is marked in Exhibit 5-3.

Step 1: Identify the Products That Are the Chosen Cost Objects. The cost objects are the 60,000 S3 and the 15,000 CL5 lenses that Plastim will produce in 2011. Plastim's goal is to first calculate the total costs and then the per-unit cost of designing, manufacturing, and distributing these lenses.

Step 2: Identify the Direct Costs of the Products. Plastim identifies as direct costs of the lenses: direct material costs, direct manufacturing labor costs, and mold cleaning and maintenance costs because these costs can be economically traced to a specific lens or mold.

Exhibit 5-5 shows the direct and indirect costs for the S3 and CL5 lenses using the ABC system. The direct costs calculations appear on lines 6, 7, 8, and 9 of Exhibit 5-5. Plastim classifies all other costs as indirect costs, as we will see in Exhibit 5-4.

Step 3: Select the Activities and Cost-Allocation Bases to Use for Allocating Indirect Costs to the Products. Following guidelines 2 and 3 for refining a costing system, Plastim identifies six activities—(a) design, (b) molding machine setups, (c) machine operations, (d) shipment setup, (e) distribution, and (f) administration—for allocating indirect costs to products. Exhibit 5-4, column 2, shows the cost hierarchy category, and column 4

Exhibit 5-3 Overview of Plastim's Activity-Based Costing System

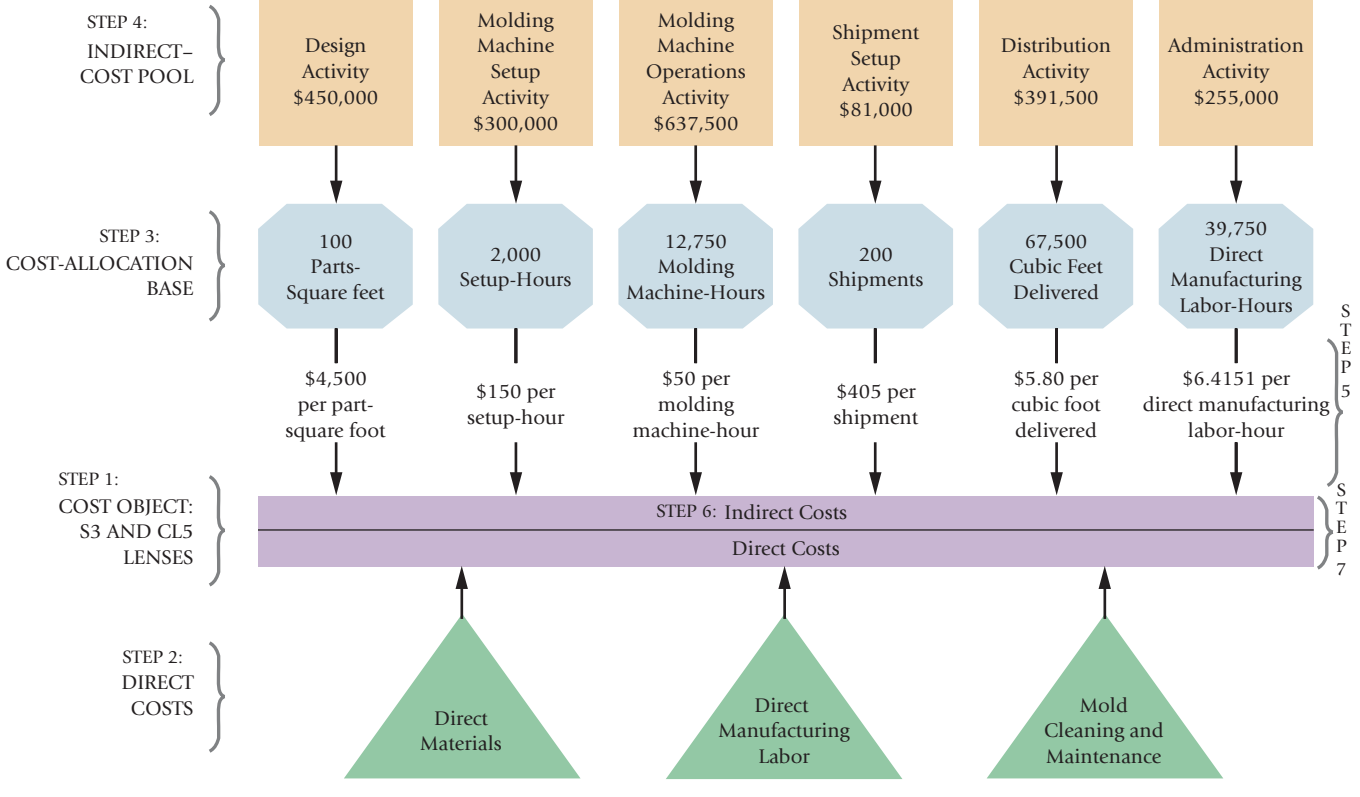


Exhibit 5-4 Activity-Cost Rates for Indirect-Cost Pools

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	A	B	C	D	E	F	G	H
1			(Step 4)	(Step 3)		(Step 5)		
2	Activity	Cost Hierarchy Category	Total Budgeted Indirect Costs	Budgeted Quantity of Cost-Allocation Base		Budgeted Indirect Cost Rate		Cause-and-Effect Relationship Between Allocation Base and Activity Cost
3	(1)	(2)	(3)	(4)		(5) = (3) ÷ (4)		(6)
4	Design	Product-sustaining	$450,000	100	parts-square feet	$ 4,500	per part-square foot	Design Department indirect costs increase with more complex molds (more parts, larger surface area).
5	Setup molding machines	Batch-level	$300,000	2,000	setup-hours	$ 150	per setup-hour	Indirect setup costs increase with setup-hours.
6	Machine operations	Output unit-level	$637,500	12,750	molding machine-hours	$ 50	per molding machine-hour	Indirect costs of operating molding machines increases with molding machine-hours.
7	Shipment setup	Batch-level	$ 81,000	200	shipments	$ 405	per shipment	Shipping costs incurred to prepare batches for shipment increase with the number of shipments.
8	Distribution	Output-unit-level	$391,500	67,500	cubic feet delivered	$ 5.80	per cubic foot delivered	Distribution costs increase with the cubic feet of packages delivered.
9	Administration	Facility sustaining	$255,000	39,750	direct manuf. labor-hours	$6.4151	per direct manuf. labor-hour	The demand for administrative resources increases with direct manufacturing labor-hours.

shows the cost-allocation base and the budgeted quantity of the cost-allocation base for each activity described in column 1.

Identifying the cost-allocation bases defines the number of activity pools into which costs must be grouped in an ABC system. For example, rather than define the design activities of product design, process design, and prototyping as separate activities, Plastim defines these three activities together as a combined "design" activity and forms a homogeneous design cost pool. Why? Because the same cost driver, the complexity of the mold, drives costs of each design activity. A second consideration for choosing a cost-allocation base is the availability of reliable data and measures. For example, in its ABC system, Plastim measures mold complexity in terms of the number of parts in the mold and the surface area of the mold (parts-square feet). If these data are difficult to obtain or measure, Plastim may be forced to use some other measure of complexity, such as the amount of material flowing through the mold that may only be weakly related to the cost of the design activity.

Step 4: Identify the Indirect Costs Associated with Each Cost-Allocation Base. In this step, Plastim assigns budgeted indirect costs for 2011 to activities (see Exhibit 5-4, column 3), to the extent possible, on the basis of a cause-and-effect relationship between the cost-allocation base for an activity and the cost. For example, all costs that have a cause-and-effect relationship to cubic feet of packages moved are assigned to the distribution cost pool. Of course, the strength of the cause-and-effect relationship between the cost-allocation base and the cost of an activity varies across cost pools. For example, the cause-and-effect relationship between direct manufacturing labor-hours and administration activity costs is not as strong as the relationship between setup-hours and setup activity costs.

Some costs can be directly identified with a particular activity. For example, cost of materials used when designing products, salaries paid to design engineers, and depreciation of equipment used in the design department are directly identified with the design activity. Other costs need to be allocated across activities. For example, on the basis of interviews or time records, manufacturing engineers and supervisors estimate the time they will spend on design, molding machine setup, and machine operations. The time to be spent on these activities serves as a basis for allocating each manufacturing engineer's and supervisor's salary

Exhibit 5-5 Plastim's Product Costs Using Activity-Based Costing System

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	A	B	C	D	E	F	G
1		60,000			15,000		
2		Simple Lenses (S3)			Complex Lenses (CL5)		
3		Total	per Unit		Total	per Unit	Total
4	**Cost Description**	(1)	(2) = (1) ÷ 60,000		(3)	(4) = (3) ÷ 15,000	(5) = (1) + (3)
5	Direct costs						
6	Direct materials	$1,125,000	$18.75		$ 675,000	$ 45.00	$1,800,000
7	Direct manufacturing labor	600,000	10.00		195,000	13.00	795,000
8	Direct mold cleaning and maintenance costs	120,000	2.00		150,000	10.00	270,000
9	Total direct costs (Step 2)	1,845,000	30.75		1,020,000	68.00	2,865,000
10	Indirect Costs of Activities						
11	Design						
12	S3, 30 parts-sq.ft. × $4,500	135,000	2.25				} 450,000
13	CL5, 70 parts-sq.ft. × $4,500				315,000	21.00	
14	Setup of molding machines						
15	S3, 500 setup-hours × $150	75,000	1.25				} 300,000
16	CL5, 1,500 setup-hours × $150				225,000	15.00	
17	Machine operations						
18	S3, 9,000 molding machine-hours × $50	450,000	7.50				} 637,500
19	CL5, 3,750 molding machine-hours × $50				187,500	12.50	
20	Shipment setup						
21	S3, 100 shipments × $405	40,500	0.67				} 81,000
22	CL5, 100 shipments × $405				40,500	2.70	
23	Distribution						
24	S3, 45,000 cubic feet delivered × $5.80	261,000	4.35				} 391,500
25	CL5, 22,500 cubic feet delivered × $5.80				130,500	8.70	
26	Administration						
27	S3, 30,000 dir. manuf. labor-hours × $6.4151	192,453	3.21				} 255,000
28	CL5, 9,750 dir. manuf. labor-hours × $6.4151				62,547	4.17	
29	Total indirect costs allocated (Step 6)	1,153,953	19.23		961,047	64.07	2,115,000
30	Total Costs (Step 7)	$2,998,953	$49.98		$1,981,047	$132.07	$4,980,000
31							

costs to various activities. Still other costs are allocated to activity-cost pools using allocation bases that measure how these costs support different activities. For example, rent costs are allocated to activity cost pools on the basis of square-feet area used by different activities.

The point here is that all costs do not fit neatly into activity categories. Often, costs may first need to be allocated to activities (Stage 1 of the 2-stage cost-allocation model) before the costs of the activities can be allocated to products (Stage 2).

Step 5: Compute the Rate per Unit of Each Cost-Allocation Base. Exhibit 5-4, column 5, summarizes the calculation of the budgeted indirect cost rates using the budgeted quantity of the cost-allocation base from Step 3 and the total budgeted indirect costs of each activity from Step 4.

Step 6: Compute the Indirect Costs Allocated to the Products. Exhibit 5-5 shows total budgeted indirect costs of $1,153,953 allocated to the simple lens and $961,047 allocated to the complex lens. Follow the budgeted indirect cost calculations for each lens in Exhibit 5-5. For each activity, Plastim's operations personnel indicate the total quantity of the cost-allocation base that will be used by each type of lens (recall that Plastim operates at capacity). For example, lines 15 and 16 of Exhibit 5-5 show that of the 2,000 total

setup-hours, the S3 lens is budgeted to use 500 hours and the CL5 lens 1,500 hours. The budgeted indirect cost rate is $150 per setup-hour (Exhibit 5-4, column 5, line 5). Therefore, the total budgeted cost of the setup activity allocated to the S3 lens is $75,000 (500 setup-hours × $150 per setup-hour) and to the CL5 lens is $225,000 (1,500 setup-hours × $150 per setup-hour). Budgeted setup cost per unit equals $1.25 ($75,000 ÷ 60,000 units) for the S3 lens and $15 ($225,000 ÷ 15,000 units) for the CL5 lens.

Step 7: Compute the Total Cost of the Products by Adding All Direct and Indirect Costs Assigned to the Products. Exhibit 5-5 presents the product costs for the simple and complex lenses. The direct costs are calculated in Step 2, and the indirect costs are calculated in Step 6. The ABC system overview in Exhibit 5-3 shows three direct-cost categories and six indirect-cost categories. The budgeted cost of each lens type in Exhibit 5-5 has nine line items, three for direct costs and six for indirect costs. The differences between the ABC product costs of S3 and CL5 calculated in Exhibit 5-5 highlight how each of these products uses different amounts of direct and indirect costs in each activity area.

We emphasize two features of ABC systems. First, these systems identify all costs used by products, whether the costs are variable or fixed in the short run. When making long-run strategic decisions using ABC information, managers want revenues to exceed total costs. Second, recognizing the hierarchy of costs is critical when allocating costs to products. It is easiest to use the cost hierarchy to first calculate the total costs of each product. The per-unit costs can then be derived by dividing total costs by the number of units produced.

Decision Point

How do managers cost products or services using ABC systems?

Comparing Alternative Costing Systems

Exhibit 5-6 compares the simple costing system using a single indirect-cost pool (Exhibit 5-1 and Exhibit 5-2) Plastim had been using and the ABC system (Exhibit 5-3 and Exhibit 5-5). Note three points in Exhibit 5-6, consistent with the guidelines for

Exhibit 5-6
Comparing Alternative Costing Systems

	Simple Costing System Using a Single Indirect-Cost Pool (1)	ABC System (2)	Difference (3) = (2) − (1)
Direct-cost categories	2 Direct materials Direct manufacturing labor	3 Direct materials Direct manufacturing labor Direct mold cleaning and maintenance labor	1
Total direct costs	$2,595,000	$2,865,000	$270,000
Indirect-cost pools	1 Single indirect-cost pool allocated using direct manufacturing labor-hours	6 Design (parts-square feet)[1] Molding machine setup (setup-hours) Machine operations (molding machine-hours) Shipment setup (number of shipments) Distribution (cubic feet delivered) Administration (direct manufacturing labor-hours)	5
Total indirect costs	$2,385,000	$2,115,000	($270,000)
Total costs assigned to simple (S3) lens	$3,525,000	$2,998,953	($526,047)
Cost per unit of simple (S3) lens	$58.75	$49.98	($8.77)
Total costs assigned to complex (CL5) lens	$1,455,000	$1,981,047	$526,047
Cost per unit of complex (CL5) lens	$97.00	$132.07	$35.07

[1]Cost drivers for the various indirect-cost pools are shown in parentheses.

refining a costing system: (1) ABC systems trace more costs as direct costs; (2) ABC systems create homogeneous cost pools linked to different activities; and (3) for each activity-cost pool, ABC systems seek a cost-allocation base that has a cause-and-effect relationship with costs in the cost pool.

The homogeneous cost pools and the choice of cost-allocation bases, tied to the cost hierarchy, give Plastim's managers greater confidence in the activity and product cost numbers from the ABC system. The bottom part of Exhibit 5-6 shows that allocating costs to lenses using only an output unit-level allocation base—direct manufacturing labor-hours, as in the single indirect-cost pool system used prior to ABC—overcosts the simple S3 lens by $8.77 per unit and undercosts the complex CL5 lens by $35.07 per unit. The CL5 lens uses a disproportionately larger amount of output unit-level, batch-level, and product-sustaining costs than is represented by the direct manufacturing labor-hour cost-allocation base. The S3 lens uses a disproportionately smaller amount of these costs.

The benefit of an ABC system is that it provides information to make better decisions. But this benefit must be weighed against the measurement and implementation costs of an ABC system.

Considerations in Implementing Activity-Based-Costing Systems

Learning Objective 6

Evaluate the costs and benefits of implementing activity-based costing systems

. . . measurement difficulties versus more accurate costs that aid in decision making

Managers choose the level of detail to use in a costing system by evaluating the expected costs of the system against the expected benefits that result from better decisions. There are telltale signs of when an ABC system is likely to provide the most benefits. Here are some of these signs:

- Significant amounts of indirect costs are allocated using only one or two cost pools.
- All or most indirect costs are identified as output unit-level costs (few indirect costs are described as batch-level costs, product-sustaining costs, or facility-sustaining costs).
- Products make diverse demands on resources because of differences in volume, process steps, batch size, or complexity.
- Products that a company is well-suited to make and sell show small profits; whereas products that a company is less suited to produce and sell show large profits.
- Operations staff has substantial disagreement with the reported costs of manufacturing and marketing products and services.

When a company decides to implement ABC, it must make important choices about the level of detail to use. Should it choose many finely specified activities, cost drivers, and cost pools, or would a few suffice? For example, Plastim could identify a different molding machine-hour rate for each different type of molding machine. In making such choices, managers weigh the benefits against the costs and limitations of implementing a more detailed costing system.

The main costs and limitations of an ABC system are the measurements necessary to implement it. ABC systems require management to estimate costs of activity pools and to identify and measure cost drivers for these pools to serve as cost-allocation bases. Even basic ABC systems require many calculations to determine costs of products and services. These measurements are costly. Activity cost rates also need to be updated regularly.

As ABC systems get very detailed and more cost pools are created, more allocations are necessary to calculate activity costs for each cost pool. This increases the chances of misidentifying the costs of different activity cost pools. For example, supervisors are more prone to incorrectly identify the time they spent on different activities if they have to allocate their time over five activities rather than only two activities.

At times, companies are also forced to use allocation bases for which data are readily available rather than allocation bases they would have liked to use. For example, a company might be forced to use the number of loads moved, instead of the degree of difficulty and distance of different loads moved, as the allocation base for

Concepts in Action — Successfully Championing ABC

Successfully implementing ABC systems requires more than an understanding of the technical details. ABC implementation often represents a significant change in the costing system and, as the chapter indicates, it requires a manager to make major choices with respect to the definition of activities and the level of detail. What then are some of the behavioral issues that the management accountant must be sensitive to?

1. **Gaining support of top management and creating a sense of urgency for the ABC effort.** This requires management accountants to lay out the vision for the ABC project and to clearly communicate its strategic benefits (for example, the resulting improvements in product and process design). It also requires selling the idea to end users and working with members of other departments as business partners of the managers in the various areas affected by the ABC project. For example, at USAA Federal Savings Bank, project managers demonstrated how the information gained from ABC would provide insights into the efficiency of bank operations, which was previously unavailable. Now the finance area communicates regularly with operations about new reports and proposed changes to the financial reporting package that managers receive.
2. **Creating a guiding coalition of managers throughout the value chain for the ABC effort.** ABC systems measure how the resources of an organization are used. Managers responsible for these resources have the best knowledge about activities and cost drivers. Getting managers to cooperate and take the initiative for implementing ABC is essential for gaining the required expertise, the proper credibility, and the necessary leadership.

   Gaining wider participation among managers has other benefits. Managers who feel more involved in the process are likely to commit more time to and be less skeptical of the ABC effort. Engaging managers throughout the value chain also creates greater opportunities for coordination and cooperation across the different functions, for example, design and manufacturing.
3. **Educating and training employees in ABC as a basis for employee empowerment.** Disseminating information about ABC throughout an organization allows workers in all areas of a business to use their knowledge of ABC to make improvements. For example, WS Industries, an Indian manufacturer of insulators, not only shared ABC information with its workers but also established an incentive plan that gave employees a percentage of the cost savings. The results were dramatic because employees were empowered and motivated to implement numerous cost-saving projects.
4. **Seeking small short-run successes as proof that the ABC implementation is yielding results.** Too often, managers and management accountants seek big results and major changes far too quickly. In many situations, achieving a significant change overnight is difficult. However, showing how ABC information has helped improve a process and save costs, even if only in small ways, motivates the team to stay on course and build momentum. The credibility gained from small victories leads to additional and bigger improvements involving larger numbers of people and different parts of the organization. Eventually ABC and ABM become rooted in the culture of the organization. Sharing short-term successes may also help motivate employees to be innovative. At USAA Federal Savings Bank, managers created a "process improvement" mailbox in Microsoft Outlook to facilitate the sharing of process improvement ideas.
5. **Recognizing that ABC information is not perfect because it balances the need for better information against the costs of creating a complex system that few managers and employees can understand.** The management accountant must help managers recognize both the value and the limitations of ABC and not oversell it. Open and honest communication about ABC ensures that managers use ABC thoughtfully to make good decisions. Critical judgments can then be made without being adversarial, and tough questions can be asked to help drive better decisions about the system.

material-handling costs, because data on degree of difficulty and distance of moves are difficult to obtain. When erroneous cost-allocation bases are used, activity-cost information can be misleading. For example, if the cost per load moved decreases, a company may conclude that it has become more efficient in its materials-handling operations. In fact, the lower cost per load move may have resulted solely from moving many lighter loads over shorter distances.

Many companies, such as Kanthal, the Swedish manufacturer of heating elements, have found the strategic and operational benefits of a less-detailed ABC system to be good enough to not warrant incurring the costs and challenges of operating a more-detailed system. Other organizations, such as Hewlett-Packard, implement ABC in chosen divisions or functions. As improvements in information technology and accompanying

declines in measurement costs continue, more-detailed ABC systems have become a practical alternative in many companies. As such trends persist, more detailed ABC systems will be better able to pass the cost–benefit test.

Global surveys of company practice suggest that ABC implementation varies among companies. Nevertheless, its framework and ideas provide a standard for judging whether any simple costing system is good enough for a particular management's purposes. Any contemplated changes in a simple costing system will inevitably be improved by ABC thinking. The Concepts in Action box on page 155 describes some of the behavioral issues that management accountants must be sensitive to as they seek to immerse an organization in ABC thinking.

Decision Point

What should managers consider when deciding to implement ABC systems?

Using ABC Systems for Improving Cost Management and Profitability

Learning Objective 7

Explain how activity-based costing systems are used in activity-based management

. . . such as pricing decisions, product-mix decisions, and cost reduction

The emphasis of this chapter so far has been on the role of ABC systems in obtaining better product costs. However, Plastim's managers must now use this information to make decisions (Step 4 of the 5-step decision process, p. 145) and to implement the decision, evaluate performance, and learn (Step 5, p. 145). **Activity-based management (ABM)** is a method of management decision making that uses activity-based costing information to improve customer satisfaction and profitability. We define ABM broadly to include decisions about pricing and product mix, cost reduction, process improvement, and product and process design.

Pricing and Product-Mix Decisions

An ABC system gives managers information about the costs of making and selling diverse products. With this information, managers can make pricing and product-mix decisions. For example, the ABC system indicates that Plastim can match its competitor's price of $53 for the S3 lens and still make a profit because the ABC cost of S3 is $49.98 (see Exhibit 5-5).

Plastim's managers offer Giovanni Motors a price of $52 for the S3 lens. Plastim's managers are confident that they can use the deeper understanding of costs that the ABC system provides to improve efficiency and further reduce the cost of the S3 lens. Without information from the ABC system, Plastim managers might have erroneously concluded that they would incur an operating loss on the S3 lens at a price of $53. This incorrect conclusion would have probably caused Plastim to reduce its business in simple lenses and focus instead on complex lenses, where its single indirect-cost-pool system indicated it is very profitable.

Focusing on complex lenses would have been a mistake. The ABC system indicates that the cost of making the complex lens is much higher—$132.07 versus $97 indicated by the direct manufacturing labor-hour-based costing system Plastim had been using. As Plastim's operations staff had thought all along, Plastim has no competitive advantage in making CL5 lenses. At a price of $137 per lens for CL5, the profit margin is very small ($137.00 – $132.07 = $4.93). As Plastim reduces its prices on simple lenses, it would need to negotiate a higher price for complex lenses with Giovanni Motors.

Cost Reduction and Process Improvement Decisions

Manufacturing and distribution personnel use ABC systems to focus on how and where to reduce costs. Managers set cost reduction targets in terms of reducing the cost per unit of the cost-allocation base in different activity areas. For example, the supervisor of the distribution activity area at Plastim could have a performance target of decreasing distribution cost per cubic foot of products delivered from $5.80 to $5.40 by reducing distribution labor and warehouse rental costs. The goal is to reduce these costs by improving the way work is done without compromising customer service or the actual or perceived value (usefulness) customers obtain from the product or service. That is, Plastim will

attempt to take out only those costs that are *nonvalue added*. Controlling physical cost drivers, such as setup-hours or cubic feet delivered, is another fundamental way that operating personnel manage costs. For example, Plastim can decrease distribution costs by packing the lenses in a way that reduces the bulkiness of the packages delivered.

The following table shows the reduction in distribution costs of the S3 and CL5 lenses as a result of actions that lower cost per cubic foot delivered (from $5.80 to $5.40) and total cubic feet of deliveries (from 45,000 to 40,000 for S3 and 22,500 to 20,000 for CL5).

	60,000 (S3) Lenses		15,000 (CL5) Lenses	
	Total (1)	per Unit (2) = (1) ÷ 60,000	Total (3)	per Unit (4) = (3) ÷ 15,000
Distribution costs (from Exhibit 5-5)				
S3, 45,000 cubic feet × $5.80/cubic foot	$261,000	$4.35		
CL5, 22,500 cubic feet × $5.80/cubic foot			$130,500	$8.70
Distribution costs as a result of process improvements				
S3, 40,000 cubic feet × $5.40/cubic foot	216,000	3.60		
CL5, 20,000 cubic feet × $5.40/cubic foot			108,000	7.20
Savings in distribution costs from process improvements	$ 45,000	$0.75	$ 22,500	$1.50

In the long run, total distribution costs will decrease from $391,500 ($261,000 + $130,500) to $324,000 ($216,000 + $108,000). In the short run, however, distribution costs may be fixed and may not decrease. Suppose all $391,500 of distribution costs are fixed costs in the short run. The efficiency improvements (using less distribution labor and space) mean that the same $391,500 of distribution costs can now be used to distribute $72{,}500 \left(\frac{\$391{,}500}{\$5.40 \text{ per cubic feet}} \right)$ cubic feet of lenses. In this case, how should costs be allocated to the S3 and CL5 lenses?

ABC systems distinguish *costs incurred* from *resources used* to design, manufacture, and deliver products and services. For the distribution activity, after process improvements,

$$\text{Costs incurred} = \$391{,}500$$

$$\text{Resources used} = \$216{,}000 \text{ (for S3 lens)} + \$108{,}000 \text{ (for CL5 lens)} = \$324{,}000$$

On the basis of the resources used by each product, Plastim's ABC system allocates $216,000 to S3 and $108,000 to CL5 for a total of $324,000. The difference of $67,500 ($391,500 – $324,000) is shown as costs of unused but available distribution capacity. Plastim's ABC system does not allocate the costs of unused capacity to products so as not to burden the product costs of S3 and CL5 with the cost of resources not used by these products. Instead, the system highlights the amount of unused capacity as a separate line item to signal to managers the need to reduce these costs, such as by redeploying labor to other uses or laying off workers. Chapter 9 discusses issues related to unused capacity in more detail.

Design Decisions

Management can evaluate how its current product and process designs affect activities and costs as a way of identifying new designs to reduce costs. For example, design decisions that decrease complexity of the mold reduce costs of design, materials, labor, machine setups, machine operations, and mold cleaning and maintenance. Plastim's customers may be willing to give up some features of the lens in exchange for a lower price. Note that Plastim's previous costing system, which used direct manufacturing labor-hours as the cost-allocation base for all indirect costs, would have mistakenly signaled that Plastim choose those designs that most reduce direct manufacturing labor-hours when, in fact, there is a weak cause-and-effect relationship between direct manufacturing labor-hours and indirect costs.

Planning and Managing Activities

Many companies implementing ABC systems for the first time analyze actual costs to identify activity-cost pools and activity-cost rates. To be useful for planning, making decisions, and managing activities, companies calculate a budgeted cost rate for each activity and use these budgeted cost rates to cost products as we saw in the Plastim example. At year-end, budgeted costs and actual costs are compared to provide feedback on how well activities were managed and to make adjustments for underallocated or overallocated indirect costs for each activity using methods described in Chapter 4. As activities and processes are changed, new activity-cost rates are calculated.

Decision Point

How can ABC systems be used to manage better?

We will return to activity-based management in later chapters. Management decisions that use activity-based costing information are described in Chapter 6, in which we discuss activity-based budgeting; Chapter 11, in which we discuss outsourcing and adding or dropping business segments; in Chapter 12, in which we evaluate alternative design choices to improve efficiency and reduce nonvalue-added costs; in Chapter 13, in which we cover reengineering and downsizing; in Chapter 14, in which we explore managing customer profitability; in Chapter 19, in which we explain quality improvements; and in Chapter 20, in which we describe how to evaluate suppliers.

Activity-Based Costing and Department Costing Systems

Learning Objective 8

Compare activity-based costing systems and department costing systems

. . . activity-based costing systems are a refinement of department costing systems into more-focused and homogenous cost pools

Companies often use costing systems that have features of ABC systems—such as multiple cost pools and multiple cost-allocation bases—but that do not emphasize individual activities. Many companies have evolved their costing systems from using a single indirect cost rate system to using separate indirect cost rates for each department (such as design, manufacturing, distribution, and so on) or each subdepartment (such as machining and assembly departments within manufacturing) that can be thought of as representing broad tasks. ABC systems, with its focus on specific activities, are a further refinement of department costing systems. In this section, we compare ABC systems and department costing systems.

Plastim uses the design department indirect cost rate to cost its design activity. Plastim calculates the design activity rate by dividing total design department costs by total parts-square feet, a measure of the complexity of the mold and the driver of design department costs. Plastim does not find it worthwhile to calculate separate activity rates within the design department for the different design activities, such as designing products, making temporary molds, and designing processes. Why? Because complexity of a mold is an appropriate cost-allocation base for costs incurred in each design activity. Design department costs are homogeneous with respect to this cost-allocation base.

In contrast, the manufacturing department identifies two activity cost pools—a setup cost pool and a machine operations cost pool—instead of a single manufacturing department overhead cost pool. It identifies these activity cost pools for two reasons. First, each of these activities within manufacturing incurs significant costs and has a different cost driver, setup-hours for the setup cost pool and machine-hours for the machine operations cost pool. Second, the S3 and CL5 lenses do not use resources from these two activity areas in the same proportion. For example, CL5 uses 75% (1,500 ÷ 2,000) of the setup-hours but only 29.4% (3,750 ÷ 12,750) of the machine-hours. Using only machine-hours, say, to allocate all manufacturing department costs at Plastim would result in CL5 being undercosted because it would not be charged for the significant amounts of setup resources it actually uses.

Based on what we just explained, using department indirect cost rates to allocate costs to products results in similar information as activity cost rates if (1) a single activity accounts for a sizable proportion of the department's costs; or (2) significant costs are incurred on different activities within a department, but each activity has the same cost driver and hence cost-allocation base (as was the case in Plastim's design department). From a purely product costing standpoint, department and activity indirect cost rates

will also result in the same product costs if (1) significant costs are incurred for different activities with different cost-allocation bases within a department but (2) different products use resources from the different activity areas in the same proportions (for example, if CL5 had used 65%, say, of the setup-hours and 65% of the machine-hours). In this case, though, not identifying activities and cost drivers within departments conceals activity cost information that would be valuable for cost management and design and process improvements.

We close this section with a note of caution. Do not assume that because department costing systems require the creation of multiple indirect cost pools that they properly recognize the drivers of costs within departments as well as how resources are used by products. As we have indicated, in many situations, department costing systems can be refined using ABC. Emphasizing activities leads to more-focused and homogeneous cost pools, aids in identifying cost-allocation bases for activities that have a better cause-and-effect relationship with the costs in activity cost pools, and leads to better design and process decisions. But these benefits of an ABC system would need to be balanced against its costs and limitations.

Decision Point

When can department costing systems be used instead of ABC systems?

ABC in Service and Merchandising Companies

Although many of the early examples of ABC originated in manufacturing, ABC has many applications in service and merchandising companies. In addition to manufacturing activities, the Plastim example includes the application of ABC to a service activity—design—and to a merchandising activity—distribution. Companies such as the Cooperative Bank, Braintree Hospital, BCTel in the telecommunications industry, and Union Pacific in the railroad industry have implemented some form of ABC system to identify profitable product mixes, improve efficiency, and satisfy customers. Similarly, many retail and wholesale companies—for example, Supervalu, a retailer and distributor of grocery store products, and Owens and Minor, a medical supplies distributor—have used ABC systems. Finally, as we describe in Chapter 14, a large number of financial services companies (as well as other companies) employ variations of ABC systems to analyze and improve the profitability of their customer interactions.

The widespread use of ABC systems in service and merchandising companies reinforces the idea that ABC systems are used by managers for strategic decisions rather than for inventory valuation. (Inventory valuation is fairly straightforward in merchandising companies and not needed in service companies.) Service companies, in particular, find great value from ABC because a vast majority of their cost structure comprises indirect costs. After all, there are few direct costs when a bank makes a loan, or when a representative answers a phone call at a call center. As we have seen, a major benefit of ABC is its ability to assign indirect costs to cost objects by identifying activities and cost drivers. As a result, ABC systems provide greater insight than traditional systems into the management of these indirect costs. The general approach to ABC in service and merchandising companies is similar to the ABC approach in manufacturing.

The Cooperative Bank followed the approach described in this chapter when it implemented ABC in its retail banking operations. It calculated the costs of various activities, such as performing ATM transactions, opening and closing accounts, administering mortgages, and processing Visa transactions. It then used the activity cost rates to calculate costs of various products, such as checking accounts, mortgages, and Visa cards and the costs of supporting different customers. ABC information helped the Cooperative Bank to improve its processes and to identify profitable products and customer segments. The Concepts in Action feature on page 160 describes how Charles Schwab has similarly benefited from using ABC analysis.

Activity-based costing raises some interesting issues when it is applied to a public service institution such as the U.S. Postal Service. The costs of delivering mail to remote locations are far greater than the costs of delivering mail within urban areas. However, for fairness and community-building reasons, the Postal Service cannot charge higher prices to customers in remote areas. In this case, activity-based costing is valuable for understanding, managing, and reducing costs but not for pricing decisions.

Concepts in Action

Time-Driven Activity-Based Costing at Charles Schwab

Time-driven activity-based costing ("TDABC") helps Charles Schwab, the leading stock brokerage, with strategic-analysis, measurement, and management of its stock trading activity across multiple channels such as branches, call centers, and the Internet. Because the costs for each channel are different, TDABC helps answer questions such as the following: What are the total costs of branch transactions versus online transactions? Which channels help reduce overall costs? How can Charles Schwab price its services to drive changes in customer behavior?

TDABC assigns all of the company's resource costs to cost objects using a framework that requires two sets of estimates. TDABC first calculates the cost of supplying resource capacity, such as broker time. The total cost of resources including personnel, management, occupancy, technology, and supplies is divided by the available capacity—the time available for brokers to do the work—to obtain the capacity cost rate. Next, TDABC uses the capacity cost rate to drive resource costs to cost objects, such as stock trades executed through brokers at a branch, by estimating the demand for resource capacity (time) that the cost object requires.

Realizing that trades executed online cost much less than trades completed through brokers, Charles Schwab developed a fee structure for trading of mutual funds to stimulate the use of cheaper channels. Charles Schwab also used TDABC information to lower process costs by several hundred million dollars annually and to better align product pricing and account management to the company's diverse client segments. The company is working on other opportunities, including priority-call routing and email marketing, to further reduce costs while maintaining or enhancing Charles Schwab's already top-rated customer service.

Sources: Kaplan, R. S. and S. R., Anderson. 2007. The innovation of time-driven activity-based costing. *Cost Management,* March–April: 5–15; Kaplan R. S. and S.R. Anderson. 2007. *Time-driven activity-based costing*. Boston, MA: Harvard Business School Press; Martinez-Jerez, F. Asis. 2007. Understanding customer profitability at Charles Schwab. Harvard Business School Case Study No. 9-106-102, January.

Problem for Self-Study

Family Supermarkets (FS) has decided to increase the size of its Memphis store. It wants information about the profitability of individual product lines: soft drinks, fresh produce, and packaged food. FS provides the following data for 2011 for each product line:

	Soft Drinks	Fresh Produce	Packaged Food
Revenues	$317,400	$840,240	$483,960
Cost of goods sold	$240,000	$600,000	$360,000
Cost of bottles returned	$ 4,800	$ 0	$ 0
Number of purchase orders placed	144	336	144
Number of deliveries received	120	876	264
Hours of shelf-stocking time	216	2,160	1,080
Items sold	50,400	441,600	122,400

FS also provides the following information for 2011:

Activity (1)	Description of Activity (2)	Total Support Costs (3)	Cost-Allocation Base (4)
1. Bottle returns	Returning of empty bottles to store	$ 4,800	Direct tracing to soft-drink line
2. Ordering	Placing of orders for purchases	$ 62,400	624 purchase orders
3. Delivery	Physical delivery and receipt of merchandise	$100,800	1,260 deliveries
4. Shelf-stocking	Stocking of merchandise on store shelves and ongoing restocking	$ 69,120	3,456 hours of shelf-stocking time
5. Customer support	Assistance provided to customers, including checkout and bagging	$122,880	614,400 items sold
Total		$360,000	

Required

1. Family Supermarkets currently allocates store support costs (all costs other than cost of goods sold) to product lines on the basis of cost of goods sold of each product line. Calculate the operating income and operating income as a percentage of revenues for each product line.
2. If Family Supermarkets allocates store support costs (all costs other than cost of goods sold) to product lines using an ABC system, calculate the operating income and operating income as a percentage of revenues for each product line.
3. Comment on your answers in requirements 1 and 2.

Solution

1. The following table shows the operating income and operating income as a percentage of revenues for each product line. All store support costs (all costs other than cost of goods sold) are allocated to product lines using cost of goods sold of each product line as the cost-allocation base. Total store support costs equal $360,000 (cost of bottles returned, $4,800 + cost of purchase orders, $62,400 + cost of deliveries, $100,800 + cost of shelf-stocking, $69,120 + cost of customer support, $122,880). The allocation rate for store support costs = $360,000 ÷ $1,200,000 (soft drinks $240,000 + fresh produce $600,000 + packaged food, $360,000) = 30% of cost of goods sold. To allocate support costs to each product line, FS multiplies the cost of goods sold of each product line by 0.30.

	Soft Drinks	Fresh Produce	Packaged Food	Total
Revenues	$317,400	$840,240	$483,960	$1,641,600
Cost of goods sold	240,000	600,000	360,000	1,200,000
Store support cost ($240,000; $600,000; $360,000) × 0.30	72,000	180,000	108,000	360,000
Total costs	312,000	780,000	468,000	1,560,000
Operating income	$ 5,400	$ 60,240	$ 15,960	$ 81,600
Operating income ÷ Revenues	1.70%	7.17%	3.30%	4.97%

2. Under an ABC system, FS identifies bottle-return costs as a direct cost because these costs can be traced to the soft drink product line. FS then calculates cost-allocation rates for each activity area (as in Step 5 of the seven-step costing system, described in the chapter, p. 152). The activity rates are as follows:

Activity (1)	Cost Hierarchy (2)	Total Costs (3)	Quantity of Cost-Allocation Base (4)	Overhead Allocation Rate (5) = (3) ÷ (4)
Ordering	Batch-level	$ 62,400	624 purchase orders	$100 per purchase order
Delivery	Batch-level	$100,800	1,260 deliveries	$80 per delivery
Shelf-stocking	Output unit-level	$ 69,120	3,456 shelf-stocking-hours	$20 per stocking-hour
Customer support	Output unit-level	$122,880	614,400 items sold	$0.20 per item sold

Store support costs for each product line by activity are obtained by multiplying the total quantity of the cost-allocation base for each product line by the activity cost rate. Operating income and operating income as a percentage of revenues for each product line are as follows:

	Soft Drinks	Fresh Produce	Packaged Food	Total
Revenues	$317,400	$840,240	$483,960	$1,641,600
Cost of goods sold	240,000	600,000	360,000	1,200,000
Bottle-return costs	4,800	0	0	4,800
Ordering costs				
(144; 336; 144) purchase orders × $100	14,400	33,600	14,400	62,400
Delivery costs				
(120; 876; 264) deliveries × $80	9,600	70,080	21,120	100,800
Shelf-stocking costs				
(216; 2,160; 1,080) stocking-hours × $20	4,320	43,200	21,600	69,120
Customer-support costs				
(50,400; 441,600; 122,400) items sold × $0.20	10,080	88,320	24,480	122,880
Total costs	283,200	835,200	441,600	1,560,000
Operating income	$ 34,200	$ 5,040	$ 42,360	$ 81,600
Operating income ÷ Revenues	10.78%	0.60%	8.75%	4.97%

3. Managers believe the ABC system is more credible than the simple costing system. The ABC system distinguishes the different types of activities at FS more precisely. It also tracks more accurately how individual product lines use resources. Rankings of relative profitability—operating income as a percentage of revenues—of the three product lines under the simple costing system and under the ABC system are as follows:

Simple Costing System		ABC System	
1. Fresh produce	7.17%	1. Soft drinks	10.78%
2. Packaged food	3.30%	2. Packaged food	8.75%
3. Soft drinks	1.70%	3. Fresh produce	0.60%

The percentage of revenues, cost of goods sold, and activity costs for each product line are as follows:

	Soft Drinks	Fresh Produce	Packaged Food
Revenues	19.34%	51.18%	29.48%
Cost of goods sold	20.00	50.00	30.00
Bottle returns	100.00	0	0
Activity areas:			
Ordering	23.08	53.84	23.08
Delivery	9.53	69.52	20.95
Shelf-stocking	6.25	62.50	31.25
Customer-support	8.20	71.88	19.92

Soft drinks have fewer deliveries and require less shelf-stocking time and customer support than either fresh produce or packaged food. Most major soft-drink suppliers deliver merchandise to the store shelves and stock the shelves themselves. In contrast, the fresh produce area has the most deliveries and consumes a large percentage of shelf-stocking time. It also has the highest number of individual sales items and so requires the most customer support. The simple costing system assumed that each product line used the resources in each activity area in the same ratio as their respective individual cost of goods sold to total cost of goods sold. Clearly, this assumption is incorrect. Relative to cost of goods sold, soft drinks and packaged food use fewer resources while fresh produce uses more resources. As a result, the ABC system reduces the costs assigned to soft drinks and packaged food and increases the costs assigned to fresh produce. The simple costing system is an example of averaging that is too broad.

FS managers can use the ABC information to guide decisions such as how to allocate a planned increase in floor space. An increase in the percentage of space allocated to soft drinks is warranted. Note, however, that ABC information should be but one input into decisions about shelf-space allocation. FS may have minimum limits on the shelf space allocated to fresh produce because of shoppers' expectations that supermarkets will carry products from this product line. In many situations, companies cannot make product decisions in isolation but must consider the effect that dropping or deemphasizing a product might have on customer demand for other products.

Pricing decisions can also be made in a more informed way with ABC information. For example, suppose a competitor announces a 5% reduction in soft-drink prices. Given the 10.78% margin FS currently earns on its soft-drink product line, it has flexibility to reduce prices and still make a profit on this product line. In contrast, the simple costing system erroneously implied that soft drinks only had a 1.70% margin, leaving little room to counter a competitor's pricing initiatives.

Decision Points

The following question-and-answer format summarizes the chapter's learning objectives. Each decision presents a key question related to a learning objective. The guidelines are the answer to that question.

Decision	Guidelines
1. When does product undercosting or overcosting occur?	Product undercosting (overcosting) occurs when a product or service consumes a high (low) level of resources but is reported to have a low (high) cost. Broad averaging, or peanut-butter costing, a common cause of undercosting or overcosting, is the result of using broad averages that uniformly assign, or spread, the cost of resources to products when the individual products use those resources in a nonuniform way. Product-cost cross-subsidization exists when one undercosted (overcosted) product results in at least one other product being overcosted (undercosted).
2. How do managers refine a costing system?	Refining a costing system means making changes that result in cost numbers that better measure the way different cost objects, such as products, use different amounts of resources of the company. These changes can require additional direct-cost tracing, the choice of more-homogeneous indirect cost pools, or the use of cost drivers as cost-allocation bases.
3. What is the difference between the design of a simple costing system and an activity-based costing (ABC) system?	The ABC system differs from the simple system by its fundamental focus on activities. The ABC system typically has more-homogeneous indirect-cost pools than the simple system, and more cost drivers are used as cost-allocation bases.

4. What is a cost hierarchy?

A cost hierarchy categorizes costs into different cost pools on the basis of the different types of cost-allocation bases or different degrees of difficulty in determining cause-and-effect (or benefits-received) relationships. A four-part hierarchy to cost products consists of output unit-level costs, batch-level costs, product-sustaining or service-sustaining costs, and facility-sustaining costs.

5. How do managers cost products or services using ABC systems?

In ABC, costs of activities are used to assign costs to other cost objects such as products or services based on the activities the products or services consume.

6. What should managers consider when deciding to implement ABC systems?

ABC systems are likely to yield the most decision-making benefits when indirect costs are a high percentage of total costs or when products and services make diverse demands on indirect resources. The main costs of ABC systems are the difficulties of the measurements necessary to implement and update the systems.

7. How can ABC systems be used to manage better?

Activity-based management (ABM) is a management method of decision making that uses ABC information to satisfy customers and improve profits. ABC systems are used for such management decisions as pricing, product-mix, cost reduction, process improvement, product and process redesign, and planning and managing activities.

8. When can department costing systems be used instead of ABC systems?

Activity-based costing systems are a refinement of department costing systems into more-focused and homogeneous cost pools. Cost information in department costing systems approximates cost information in ABC systems only when each department has a single activity (or a single activity accounts for a significant proportion of department costs), a single cost driver for different activities, or when different products use the different activities of the department in the same proportions.

Terms to Learn

This chapter and the Glossary at the end of this book contain definitions of the following important terms:

activity (**p. 146**)
activity-based costing (ABC) (**p. 146**)
activity-based management (ABM) (**p. 156**)
batch-level costs (**p. 149**)
cost hierarchy (**p. 149**)
facility-sustaining costs (**p. 149**)
output unit-level costs (**p. 149**)
product-cost cross-subsidization (**p. 140**)
product overcosting (**p. 140**)
product-sustaining costs (**p. 149**)
product undercosting (**p. 140**)
refined costing system (**p. 145**)
service-sustaining costs (**p. 149**)

Assignment Material

MyAccountingLab

Questions

5-1 What is broad averaging and what consequences can it have on costs?
5-2 Why should managers worry about product overcosting or undercosting?
5-3 What is costing system refinement? Describe three guidelines for refinement.
5-4 What is an activity-based approach to designing a costing system?
5-5 Describe four levels of a cost hierarchy.
5-6 Why is it important to classify costs into a cost hierarchy?
5-7 What are the key reasons for product cost differences between simple costing systems and ABC systems?
5-8 Describe four decisions for which ABC information is useful.
5-9 "Department indirect-cost rates are never activity-cost rates." Do you agree? Explain.
5-10 Describe four signs that help indicate when ABC systems are likely to provide the most benefits.

5-11 What are the main costs and limitations of implementing ABC systems?

5-12 "ABC systems only apply to manufacturing companies." Do you agree? Explain.

5-13 "Activity-based costing is the wave of the present and the future. All companies should adopt it." Do you agree? Explain.

5-14 "Increasing the number of indirect-cost pools is guaranteed to sizably increase the accuracy of product or service costs." Do you agree? Why?

5-15 The controller of a retail company has just had a $50,000 request to implement an ABC system quickly turned down. A senior vice president, in rejecting the request, noted, "Given a choice, I will always prefer a $50,000 investment in improving things a customer sees or experiences, such as our shelves or our store layout. How does a customer benefit by our spending $50,000 on a supposedly better accounting system?" How should the controller respond?

Exercises

5-16 **Cost hierarchy.** Hamilton, Inc., manufactures boom boxes (music systems with radio, cassette, and compact disc players) for several well-known companies. The boom boxes differ significantly in their complexity and their manufacturing batch sizes. The following costs were incurred in 2011:

a. Indirect manufacturing labor costs such as supervision that supports direct manufacturing labor, $1,450,000
b. Procurement costs of placing purchase orders, receiving materials, and paying suppliers related to the number of purchase orders placed, $850,000
c. Cost of indirect materials, $275,000
d. Costs incurred to set up machines each time a different product needs to be manufactured, $630,000
e. Designing processes, drawing process charts, making engineering process changes for products, $775,000
f. Machine-related overhead costs such as depreciation, maintenance, production engineering, $1,500,000 (These resources relate to the activity of running the machines.)
g. Plant management, plant rent, and plant insurance, $925,000

Required

1. Classify each of the preceding costs as output unit-level, batch-level, product-sustaining, or facility-sustaining. Explain each answer.
2. Consider two types of boom boxes made by Hamilton, Inc. One boom box is complex to make and is produced in many batches. The other boom box is simple to make and is produced in few batches. Suppose that Hamilton needs the same number of machine-hours to make each type of boom box and that Hamilton allocates all overhead costs using machine-hours as the only allocation base. How, if at all, would the boom boxes be miscosted? Briefly explain why.
3. How is the cost hierarchy helpful to Hamilton in managing its business?

5-17 **ABC, cost hierarchy, service.** (CMA, adapted) Vineyard Test Laboratories does heat testing (HT) and stress testing (ST) on materials and operates at capacity. Under its current simple costing system, Vineyard aggregates all operating costs of $1,190,000 into a single overhead cost pool. Vineyard calculates a rate per test-hour of $17 ($1,190,000 ÷ 70,000 total test-hours). HT uses 40,000 test-hours, and ST uses 30,000 test-hours. Gary Celeste, Vineyard's controller, believes that there is enough variation in test procedures and cost structures to establish separate costing and billing rates for HT and ST. The market for test services is becoming competitive. Without this information, any miscosting and mispricing of its services could cause Vineyard to lose business. Celeste divides Vineyard's costs into four activity-cost categories.

a. Direct-labor costs, $146,000. These costs can be directly traced to HT, $100,000, and ST, $46,000.
b. Equipment-related costs (rent, maintenance, energy, and so on), $350,000. These costs are allocated to HT and ST on the basis of test-hours.
c. Setup costs, $430,000. These costs are allocated to HT and ST on the basis of the number of setup-hours required. HT requires 13,600 setup-hours, and ST requires 3,600 setup-hours.
d. Costs of designing tests, $264,000. These costs are allocated to HT and ST on the basis of the time required for designing the tests. HT requires 3,000 hours, and ST requires 1,400 hours.

Required

1. Classify each activity cost as output unit-level, batch-level, product- or service-sustaining, or facility-sustaining. Explain each answer.
2. Calculate the cost per test-hour for HT and ST. Explain briefly the reasons why these numbers differ from the $17 per test-hour that Vineyard calculated using its simple costing system.
3. Explain the accuracy of the product costs calculated using the simple costing system and the ABC system. How might Vineyard's management use the cost hierarchy and ABC information to better manage its business?

5-18 Alternative allocation bases for a professional services firm. The Walliston Group (WG) provides tax advice to multinational firms. WG charges clients for (a) direct professional time (at an hourly rate) and (b) support services (at 30% of the direct professional costs billed). The three professionals in WG and their rates per professional hour are as follows:

Professional	Billing Rate per Hour
Max Walliston	$640
Alexa Boutin	220
Jacob Abbington	100

WG has just prepared the May 2011 bills for two clients. The hours of professional time spent on each client are as follows:

	Hours per Client	
Professional	San Antonio Dominion	Amsterdam Enterprises
Walliston	26	4
Boutin	5	14
Abbington	39	52
Total	70	70

Required

1. What amounts did WG bill to San Antonio Dominion and Amsterdam Enterprises for May 2011?
2. Suppose support services were billed at $75 per professional labor-hour (instead of 30% of professional labor costs). How would this change affect the amounts WG billed to the two clients for May 2011? Comment on the differences between the amounts billed in requirements 1 and 2.
3. How would you determine whether professional labor costs or professional labor-hours is the more appropriate allocation base for WG's support services?

5-19 Plant-wide, department, and ABC indirect cost rates. Automotive Products (AP) designs and produces automotive parts. In 2011, actual variable manufacturing overhead is $308,600. AP's simple costing system allocates variable manufacturing overhead to its three customers based on machine-hours and prices its contracts based on full costs. One of its customers has regularly complained of being charged noncompetitive prices, so AP's controller Devon Smith realizes that it is time to examine the consumption of overhead resources more closely. He knows that there are three main departments that consume overhead resources: design, production, and engineering. Interviews with the department personnel and examination of time records yield the following detailed information:

Home Insert Page Layout Formulas Data Review View

	A	B	C	D	E	F
1				Usage of Cost Drivers by Customer Contract		
2	Department	Cost Driver	Variable Manufacturing Overhead in 2011	United Motors	Holden Motors	Leland Vehicle
3	Design	CAD-design-hours	$ 39,000	110	200	80
4	Production	Engineering-hours	29,600	70	60	240
5	Engineering	Machine-hours	240,000	120	2,800	1,080
6	Total		$308,600			

Required

1. Compute the variable manufacturing overhead allocated to each customer in 2011 using the simple costing system that uses machine-hours as the allocation base.
2. Compute the variable manufacturing overhead allocated to each customer in 2011 using department-based variable manufacturing overhead rates.
3. Comment on your answers in requirements 1 and 2. Which customer do you think was complaining about being overcharged in the simple system? If the new department-based rates are used to price contracts, which customer(s) will be unhappy? How would you respond to these concerns?

4. How else might AP use the information available from its department-by-department analysis of variable manufacturing overhead costs?
5. AP's managers are wondering if they should further refine the department-by-department costing system into an ABC system by identifying different activities within each department. Under what conditions would it not be worthwhile to further refine the department costing system into an ABC system?

5-20 Plant-wide, department, and activity-cost rates. Tarquin's Trophies makes trophies and plaques and operates at capacity. Tarquin does large custom orders, such as the participant trophies for the Mishawaka Little League. The controller has asked you to compare plant-wide, department, and activity-based cost allocation.

Tarquin's Trophies
Budgeted Information
For the Year Ended November 30, 2011

Forming Department	Trophies	Plaques	Total
Direct materials	$13,000	$11,250	$24,250
Direct labor	15,600	9,000	24,600
Overhead Costs			
Setup			12,000
Supervision			10,386

Assembly Department	Trophies	Plaques	Total
Direct materials	$ 2,600	$ 9,375	$11,975
Direct labor	7,800	10,500	18,300
Overhead costs			
Setup			23,000
Supervision			10,960

Other information follows:

Setup costs vary with the number of batches processed in each department. The budgeted number of batches for each product line in each department is as follows:

	Trophies	Plaques
Forming department	40	116
Assembly department	43	103

Supervision costs vary with direct labor costs in each department.

Required

1. Calculate the budgeted cost of trophies and plaques based on a single plant-wide overhead rate, if total overhead is allocated based on total direct costs.
2. Calculate the budgeted cost of trophies and plaques based on departmental overhead rates, where forming department overhead costs are allocated based on direct labor costs of the forming department, and assembly department overhead costs are allocated based on total direct costs of the assembly department.
3. Calculate the budgeted cost of trophies and plaques if Tarquin allocates overhead costs in each department using activity-based costing.
4. Explain how the disaggregation of information could improve or reduce decision quality.

5-21 ABC, process costing. Parker Company produces mathematical and financial calculators and operates at capacity. Data related to the two products are presented here:

	Mathematical	Financial
Annual production in units	50,000	100,000
Direct material costs	$150,000	$300,000
Direct manufacturing labor costs	$ 50,000	$100,000
Direct manufacturing labor-hours	2,500	5,000
Machine-hours	25,000	50,000
Number of production runs	50	50
Inspection hours	1,000	500

Total manufacturing overhead costs are as follows:

	Total
Machining costs	$375,000
Setup costs	120,000
Inspection costs	105,000

Required

1. Choose a cost driver for each overhead cost pool and calculate the manufacturing overhead cost per unit for each product.
2. Compute the manufacturing cost per unit for each product.

5-22 Activity-based costing, service company. Quikprint Corporation owns a small printing press that prints leaflets, brochures, and advertising materials. Quikprint classifies its various printing jobs as standard jobs or special jobs. Quikprint's simple job-costing system has two direct-cost categories (direct materials and direct labor) and a single indirect-cost pool. Quikprint operates at capacity and allocates all indirect costs using printing machine-hours as the allocation base.

Quikprint is concerned about the accuracy of the costs assigned to standard and special jobs and therefore is planning to implement an activity-based costing system. Quickprint's ABC system would have the same direct-cost categories as its simple costing system. However, instead of a single indirect-cost pool there would now be six categories for assigning indirect costs: design, purchasing, setup, printing machine operations, marketing, and administration. To see how activity-based costing would affect the costs of standard and special jobs, Quikprint collects the following information for the fiscal year 2011 that just ended.

Home Insert Page Layout Formulas Data Review View

	A	B	C	D	E	F	G	H
1		Standard Job	Special Job	Total	Cause-and-Effect Relationship Between Allocation Base and Activity Cost			
2	Number of printing jobs	400	200					
3	Price per job	$1,200	$ 1,500					
4	Cost of supplies per job	$ 200	$ 250					
5	Direct labor costs per job	$ 180	$ 200					
6	Printing machine-hours per job	10	10					
7	Cost of printing machine operations			$150,000	Indirect costs of operating printing machines			
8					increase with printing machine hours			
9	Setup-hours per job	4	7					
10	Setup costs			$ 90,000	Indirect setup costs increase with setup hours			
11	Total number of purchase orders	400	500					
12	Purchase order costs			$ 36,000	Indirect purchase order costs increase with			
13					number of purchase orders			
14	Design costs	$8,000	$32,000	$ 40,000	Design costs are allocated to standard and special			
15					jobs based on a special study of the design department			
16	Marketing costs as a percentage of revenues	5%	5%	$ 39,000				
17	Administration costs			$ 48,000	Demand for administrative resources increases with direct labor costs			

Required

1. Calculate the cost of a standard job and a special job under the simple costing system.
2. Calculate the cost of a standard job and a special job under the activity-based costing system.
3. Compare the costs of a standard job and a special job in requirements 1 and 2. Why do the simple and activity-based costing systems differ in the cost of a standard job and a special job?
4. How might Quikprint use the new cost information from its activity-based costing system to better manage its business?

5-23 Activity-based costing, manufacturing. Open Doors, Inc., produces two types of doors, interior and exterior. The company's simple costing system has two direct cost categories (materials and labor) and one indirect cost pool. The simple costing system allocates indirect costs on the basis of machine-hours. Recently, the owners of Open Doors have been concerned about a decline in the market share for

their interior doors, usually their biggest seller. Information related to Open Doors production for the most recent year follows:

	Interior	Exterior
Units sold	3,200	1,800
Selling price	$ 125	$ 200
Direct material cost per unit	$ 30	$ 45
Direct manufacturing labor cost per hour	$ 16	$ 16
Direct manufacturing labor-hours per unit	1.50	2.25
Production runs	40	85
Material moves	72	168
Machine setups	45	155
Machine-hours	5,500	4,500
Number of inspections	250	150

The owners have heard of other companies in the industry that are now using an activity-based costing system and are curious how an ABC system would affect their product costing decisions. After analyzing the indirect cost pool for Open Doors, six activities were identified as generating indirect costs: production scheduling, material handling, machine setup, assembly, inspection, and marketing. Open Doors collected the following data related to the indirect cost activities:

Activity	Activity Cost	Activity Cost Driver
Production scheduling	$95,000	Production runs
Material handling	$45,000	Material moves
Machine setup	$25,000	Machine setups
Assembly	$60,000	Machine-hours
Inspection	$ 8,000	Number of inspections

Marketing costs were determined to be 3% of the sales revenue for each type of door.

Required

1. Calculate the cost of an interior door and an exterior door under the existing simple costing system.
2. Calculate the cost of an interior door and an exterior door under an activity-based costing system.
3. Compare the costs of the doors in requirements 1 and 2. Why do the simple and activity-based costing systems differ in the cost of an interior and exterior door?
4. How might Open Door, Inc., use the new cost information from its activity-based costing system to address the declining market share for interior doors?

5-24 ABC, retail product-line profitability. Family Supermarkets (FS) operates at capacity and decides to apply ABC analysis to three product lines: baked goods, milk and fruit juice, and frozen foods. It identifies four activities and their activity cost rates as follows:

Ordering	$100 per purchase order
Delivery and receipt of merchandise	$ 80 per delivery
Shelf-stocking	$ 20 per hour
Customer support and assistance	$ 0.20 per item sold

The revenues, cost of goods sold, store support costs, the activities that account for the store support costs, and activity-area usage of the three product lines are as follows:

	Baked Goods	Milk and Fruit Juice	Frozen Products
Financial data			
Revenues	$57,000	$63,000	$52,000
Cost of goods sold	$38,000	$47,000	$35,000
Store support	$11,400	$14,100	$10,500
Activity-area usage (cost-allocation base)			
Ordering (purchase orders)	30	25	13
Delivery (deliveries)	98	36	28
Shelf-stocking (hours)	183	166	24
Customer support (items sold)	15,500	20,500	7,900

Under its simple costing system, FS allocated support costs to products at the rate of 30% of cost of goods sold.

Required

1. Use the simple costing system to prepare a product-line profitability report for FS.
2. Use the ABC system to prepare a product-line profitability report for FS.
3. What new insights does the ABC system in requirement 2 provide to FS managers?

5-25 ABC, wholesale, customer profitability. Ramirez Wholesalers operates at capacity and sells furniture items to four department-store chains (customers). Mr. Ramirez commented, "We apply ABC to determine product-line profitability. The same ideas apply to customer profitability, and we should find out our customer profitability as well." Ramirez Wholesalers sends catalogs to corporate purchasing departments on a monthly basis. The customers are entitled to return unsold merchandise within a six-month period from the purchase date and receive a full purchase price refund. The following data were collected from last year's operations:

	Chain			
	1	2	3	4
Gross sales	$55,000	$25,000	$100,000	$75,000
Sales returns:				
Number of items	101	25	65	35
Amount	$11,000	$ 3,500	$ 7,000	$ 6,500
Number of orders:				
Regular	45	175	52	75
Rush	11	48	11	32

Ramirez has calculated the following activity rates:

Activity	Cost-Driver Rate
Regular order processing	$25 per regular order
Rush order processing	$125 per rush order
Returned items processing	$15 per item
Catalogs and customer support	$1,100 per customer

Customers pay the transportation costs. The cost of goods sold averages 70% of sales.

Required

Determine the contribution to profit from each chain last year. Comment on your solution.

5-26 ABC, activity area cost-driver rates, product cross-subsidization. Idaho Potatoes (IP) operates at capacity and processes potatoes into potato cuts at its highly automated Pocatello plant. It sells potatoes to the retail consumer market and to the institutional market, which includes hospitals, cafeterias, and university dormitories.

IP's simple costing system, which does not distinguish between potato cuts processed for retail and institutional markets, has a single direct-cost category (direct materials, i.e. raw potatoes) and a single indirect-cost pool (production support). Support costs, which include packaging materials, are allocated on the basis of pounds of potato cuts processed. The company uses 1,200,000 pounds of raw potatoes to process 1,000,000 pounds of potato cuts. At the end of 2011, IP unsuccessfully bid for a large institutional contract. Its bid was reported to be 30% above the winning bid. This feedback came as a shock because IP included only a minimum profit margin on its bid and the Pocatello plant was acknowledged as the most efficient in the industry.

As a result of its review process of the lost contract bid, IP decided to explore ways to refine its costing system. The company determined that 90% of the direct materials (raw potatoes) related to the retail market and 10% to the institutional market. In addition, the company identified that packaging materials could be directly traced to individual jobs ($180,000 for retail and $8,000 for institutional). Also, the company used ABC to identify three main activity areas that generated support costs: cleaning, cutting, and packaging.

- **Cleaning Activity Area**—The cost-allocation base is pounds of raw potatoes cleaned.
- **Cutting Activity Area**—The production line produces (a) 250 pounds of retail potato cuts per cutting-hour and (b) 400 pounds of institutional potato cuts per cutting-hour. The cost-allocation base is cutting-hours on the production line.
- **Packaging Activity Area**—The packaging line packages (a) 25 pounds of retail potato cuts per packaging-hour and (b) 100 pounds of institutional potato cuts per packaging-hour. The cost-allocation base is packaging-hours on the production line.

The following table summarizes the actual costs for 2011 before and after the preceding cost analysis:

		After the cost analysis			
	Before the cost analysis	Production Support	Retail	Institutional	Total
Direct materials used					
Potatoes	$ 150,000		$135,000	$15,000	$ 150,000
Packaging			180,000	8,000	188,000
Production support	983,000				
Cleaning		$120,000			120,000
Cutting		231,000			231,000
Packaging		444,000			444,000
Total	$1,133,000	$795,000	$315,000	$23,000	$1,133,000

Required

1. Using the simple costing system, what is the cost per pound of potato cuts produced by IP?
2. Calculate the cost rate per unit of the cost driver in the (a) cleaning, (b) cutting, and (c) packaging activity areas.
3. Suppose IP uses information from its activity cost rates to calculate costs incurred on retail potato cuts and institutional potato cuts. Using the ABC system, what is the cost per pound of (a) retail potato cuts and (b) institutional potato cuts?
4. Comment on the cost differences between the two costing systems in requirements 1 and 3. How might IP use the information in requirement 3 to make better decisions?

5-27 Activity-based costing. The job costing system at Smith's Custom Framing has five indirect cost pools (purchasing, material handling, machine maintenance, product inspection, and packaging). The company is in the process of bidding on two jobs; Job 215, an order of 15 intricate personalized frames, and Job 325, an order of 6 standard personalized frames. The controller wants you to compare overhead allocated under the current simple job-costing system and a newly-designed activity-based job-costing system. Total budgeted costs in each indirect cost pool and the budgeted quantity of activity driver are as follows:

	Budgeted Overhead	Activity Driver	Budgeted Quantity of Activity Driver
Purchasing	$ 70,000	Purchase orders processed	2,000
Material handling	87,500	Material moves	5,000
Machine maintenance	237,300	Machine-hours	10,500
Product inspection	18,900	Inspections	1,200
Packaging	39,900	Units produced	3,800
	$453,600		

Information related to Job 215 and Job 325 follows. Job 215 incurs more batch-level costs because it uses more types of materials that need to be purchased, moved, and inspected relative to Job 325.

	Job 215	Job 325
Number of purchase orders	25	8
Number of material moves	10	4
Machine-hours	40	60
Number of inspections	9	3
Units produced	15	6

1. Compute the total overhead allocated to each job under a simple costing system, where overhead is allocated based on machine-hours.
2. Compute the total overhead allocated to each job under an activity-based costing system using the appropriate activity drivers.
3. Explain why Smith's Custom Framing might favor the ABC job-costing system over the simple job-costing system, especially in its bidding process.

5-28 ABC, product costing at banks, cross-subsidization. National Savings Bank (NSB) is examining the profitability of its Premier Account, a combined savings and checking account. Depositors receive a 7% annual interest rate on their average deposit. NSB earns an interest rate spread of 3% (the difference

between the rate at which it lends money and the rate it pays depositors) by lending money for home loan purposes at 10%. Thus, NSB would gain $60 on the interest spread if a depositor had an average Premier Account balance of $2,000 in 2011 ($2,000 × 3% = $60).

The Premier Account allows depositors unlimited use of services such as deposits, withdrawals, checking accounts, and foreign currency drafts. Depositors with Premier Account balances of $1,000 or more receive unlimited free use of services. Depositors with minimum balances of less than $1,000 pay a $22-a-month service fee for their Premier Account.

NSB recently conducted an activity-based costing study of its services. It assessed the following costs for six individual services. The use of these services in 2011 by three customers is as follows:

	Activity-Based Cost per "Transaction"	Account Usage		
		Holt	Turner	Graham
Deposit/withdrawal with teller	$ 2.30	42	48	5
Deposit/withdrawal with automatic teller machine (ATM)	0.70	7	19	17
Deposit/withdrawal on prearranged monthly basis	0.40	0	13	62
Bank checks written	8.40	11	1	3
Foreign currency drafts	12.40	4	2	6
Inquiries about account balance	1.40	12	20	9
Average Premier Account balance for 2011		$1,100	$700	$24,600

Assume Holt and Graham always maintain a balance above $1,000, whereas Turner always has a balance below $1,000.

Required

1. Compute the 2011 profitability of the Holt, Turner, and Graham Premier Accounts at NSB.
2. Why might NSB worry about the profitability of individual customers if the Premier Account product offering is profitable as a whole?
3. What changes would you recommend for NSB's Premier Account?

MyAccountingLab

Problems

5-29 Job costing with single direct-cost category, single indirect-cost pool, law firm. Wigan Associates is a recently formed law partnership. Ellery Hanley, the managing partner of Wigan Associates, has just finished a tense phone call with Martin Offiah, president of Widnes Coal. Offiah strongly complained about the price Wigan charged for some legal work done for Widnes Coal.

Hanley also received a phone call from its only other client (St. Helen's Glass), which was very pleased with both the quality of the work and the price charged on its most recent job.

Wigan Associates operates at capacity and uses a cost-based approach to pricing (billing) each job. Currently it uses a simple costing system with a single direct-cost category (professional labor-hours) and a single indirect-cost pool (general support). Indirect costs are allocated to cases on the basis of professional labor-hours per case. The job files show the following:

	Widnes Coal	St. Helen's Glass
Professional labor	104 hours	96 hours

Professional labor costs at Wigan Associates are $70 an hour. Indirect costs are allocated to cases at $105 an hour. Total indirect costs in the most recent period were $21,000.

Required

1. Why is it important for Wigan Associates to understand the costs associated with individual jobs?
2. Compute the costs of the Widnes Coal and St. Helen's Glass jobs using Wigan's simple costing system.

5-30 Job costing with multiple direct-cost categories, single indirect-cost pool, law firm (continuation of 5-29). Hanley asks his assistant to collect details on those costs included in the $21,000 indirect-cost pool that can be traced to each individual job. After analysis, Wigan is able to reclassify $14,000 of the $21,000 as direct costs:

Other Direct Costs	Widnes Coal	St. Helen's Glass
Research support labor	$1,600	$ 3,400
Computer time	500	1,300
Travel and allowances	600	4,400
Telephones/faxes	200	1,000
Photocopying	250	750
Total	$3,150	$10,850

Hanley decides to calculate the costs of each job as if Wigan had used six direct cost-pools and a single indirect-cost pool. The single indirect-cost pool would have $7,000 of costs and would be allocated to each case using the professional labor-hours base.

Required

1. What is the revised indirect-cost allocation rate per professional labor-hour for Wigan Associates when total indirect costs are $7,000?
2. Compute the costs of the Widnes and St. Helen's jobs if Wigan Associates had used its refined costing system with multiple direct-cost categories and one indirect-cost pool.
3. Compare the costs of Widnes and St. Helen's jobs in requirement 2 with those in requirement 2 of Problem 5-29. Comment on the results.

5-31 Job costing with multiple direct-cost categories, multiple indirect-cost pools, law firm (continuation of 5-29 and 5-30). Wigan has two classifications of professional staff: partners and associates. Hanley asks his assistant to examine the relative use of partners and associates on the recent Widnes Coal and St. Helen's jobs. The Widnes job used 24 partner-hours and 80 associate-hours. The St. Helen's job used 56 partner-hours and 40 associate-hours. Therefore, totals of the two jobs together were 80 partner-hours and 120 associate-hours. Hanley decides to examine how using separate direct-cost rates for partners and associates and using separate indirect-cost pools for partners and associates would have affected the costs of the Widnes and St. Helen's jobs. Indirect costs in each indirect-cost pool would be allocated on the basis of total hours of that category of professional labor. From the total indirect cost-pool of $7,000, $4,600 is attributable to the activities of partners, and $2,400 is attributable to the activities of associates.

The rates per category of professional labor are as follows:

Category of Professional Labor	Direct Cost per Hour	Indirect Cost per Hour
Partner	$100.00	$4,600 ÷ 80 hours = $57.50
Associate	50.00	$2,400 ÷ 120 hours = $20.00

Required

1. Compute the costs of the Widnes and St. Helen's cases using Wigan's further refined system, with multiple direct-cost categories and multiple indirect-cost pools.
2. For what decisions might Wigan Associates find it more useful to use this job-costing approach rather than the approaches in Problem 5-29 or 5-30?

5-32 Plant-wide, department, and activity-cost rates. Allen's Aero Toys makes two models of toy airplanes, fighter jets, and cargo planes. The fighter jets are more detailed and require smaller batch sizes. The controller has asked you to compare plant-wide, department, and activity-based cost allocations.

Allen's Aero Toys
Budgeted Information per unit
For the Year Ended 30 November 2010

Assembly Department	Fighters	Cargo	Total
Direct materials	$2.50	$3.75	$ 6.25
Direct manufacturing labor	3.50	2.00	5.50
Total direct cost per unit	$6.00	$5.75	$11.75
Painting Department	**Fighters**	**Cargo**	
Direct materials	$0.50	$1.00	$ 1.50
Direct manufacturing labor	2.25	1.50	3.75
Total direct cost per unit	$2.75	$2.50	$ 5.25
Number of units produced	800	740	

The budgeted overhead cost for each department is as follows:

	Assembly Department	Painting Department	Total
Materials handling	$1,700	$ 900	$ 2,600
Quality inspection	2,750	1,150	3,900
Utilities	2,580	2,100	4,680
	$7,030	$4,150	$11,180

Other information follows:

Materials handling and quality inspection costs vary with the number of batches processed in each department. The budgeted number of batches for each product line in each department is as follows:

	Fighters	Cargo	Total
Assembly department	150	48	198
Painting department	100	32	132
Total	250	80	330

Utilities costs vary with direct manufacturing labor cost in each department.

Required

1. Calculate the budgeted cost per unit for fighter jets and cargo planes based on a single plant-wide overhead rate, if total overhead is allocated based on total direct costs.
2. Calculate the budgeted cost per unit for fighter jets and cargo planes based on departmental overhead rates, where assembly department overhead costs are allocated based on direct manufacturing labor costs of the assembly department and painting department overhead costs are allocated based on total direct costs of the painting department.
3. Calculate the budgeted cost per unit for fighter jets and cargo planes if Allen's Aero Toys allocates overhead costs using activity-based costing.
4. Explain how activity-based costing could improve or reduce decision quality.

5-33 Department and activity-cost rates, service sector. Roxbury's Radiology Center (RRC) performs X-rays, ultrasounds, CT scans, and MRIs. RRC has developed a reputation as a top Radiology Center in the state. RRC has achieved this status because it constantly reexamines its processes and procedures. RRC has been using a single, facility-wide overhead allocation rate. The VP of Finance believes that RRC can make better process improvements if it uses more disaggregated cost information. She says, "We have state of the art medical imaging technology. Can't we have state of the art accounting technology?"

Roxbury's Radiology Center
Budgeted Information
For the Year Ended May 30, 2011

	X-rays	Ultrasound	CT scan	MRI	Total
Technician labor	$ 64,000	$104,000	$119,000	$106,000	$ 393,000
Depreciation	136,800	231,000	400,200	792,000	1560,000
Materials	22,400	16,500	23,900	30,800	93,600
Administration					19,000
Maintenance					260,000
Sanitation					267,900
Utilities					121,200
	$223,200	$351,500	$543,100	$928,800	$2,714,700
Number of procedures	2,555	4,760	3,290	2,695	
Minutes to clean after each procedure	10	10	20	40	
Minutes for each procedure	5	20	15	40	

RRC operates at capacity. The proposed allocation bases for overhead are as follows:

Administration	Number of procedures
Maintenance (including parts)	Capital cost of the equipment (use Depreciation)
Sanitation	Total cleaning minutes
Utilities	Total procedure minutes

Required

1. Calculate the budgeted cost per service for X-rays, Ultrasounds, CT scans, and MRIs using direct technician labor costs as the allocation basis.
2. Calculate the budgeted cost per service of X-rays, Ultrasounds, CT scans, and MRIs if RRC allocated overhead costs using activity-based costing.
3. Explain how the disaggregation of information could be helpful to RRC's intention to continuously improve its services.

5-34 Choosing cost drivers, activity-based costing, activity-based management. Annie Warbucks runs a dance studio with childcare and adult fitness classes. Annie's budget for the upcoming year is as follows:

Annie Warbuck's Dance Studio
Budgeted Costs and Activities
For the Year Ended June 30, 2010

Dance teacher salaries	$62,100	
Child care teacher salaries	24,300	
Fitness instructor salaries	39,060	
Total salaries		$125,460
Supplies (art, dance accessories, fitness)		21,984
Rent, maintenance, and utilities		97,511
Administration salaries		50,075
Marketing expenses		21,000
Total		$316,030

Other budget information follows:

	Dance	Childcare	Fitness	Total
Square footage	6,000	3,150	2,500	11,650
Number of participants	1,485	450	270	2,205
Teachers per hour	3	3	1	7
Number of advertisements	26	24	20	70

Required

1. Determine which costs are direct costs and which costs are indirect costs of different programs.
2. Choose a cost driver for the indirect costs and calculate the budgeted cost per unit of the cost driver. Explain briefly your choice of cost driver.
3. Calculate the budgeted costs of each program.
4. How can Annie use this information for pricing? What other factors should she consider?

5-35 Activity-based costing, merchandising. Pharmacare, Inc., a distributor of special pharmaceutical products, operates at capacity and has three main market segments:

a. General supermarket chains
b. Drugstore chains
c. Mom-and-Pop single-store pharmacies

Rick Flair, the new controller of Pharmacare, reported the following data for 2011:

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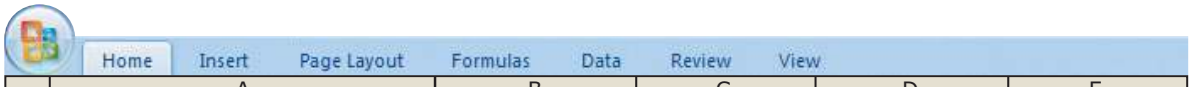
	A	B	C	D	E
1					
2	**Pharmacare, 2011**	**General**			
3		**Supermarket**	**Drugstore**	**Mom-and-Pop**	
4		**Chains**	**Chains**	**Single Stores**	**Pharmacare**
5	Revenues	$3,708,000	$3,150,000	$1,980,000	$8,838,000
6	Cost of goods sold	3,600,000	3,000,000	1,800,000	8,400,000
7	Gross margin	$ 108,000	$ 150,000	$ 180,000	438,000
8	Other operating costs				301,080
9	Operating income				$ 136,920

For many years, Pharmacare has used gross margin percentage [(Revenue – Cost of goods sold) ÷ Revenue] to evaluate the relative profitability of its market segments. But, Flair recently attended a seminar on activity-based costing and is considering using it at Pharmacare to analyze and allocate "other operating costs." He meets with all the key managers and several of his operations and sales staff and they agree that there are five key activities that drive other operating costs at Pharmacare:

Activity Area	Cost Driver
Order processing	Number of customer purchase orders
Line-item processing	Number of line items ordered by customers
Delivering to stores	Number of store deliveries
Cartons shipped to store	Number of cartons shipped
Stocking of customer store shelves	Hours of shelf-stocking

Each customer order consists of one or more line items. A line item represents a single product (such as Extra-Strength Tylenol Tablets). Each product line item is delivered in one or more separate cartons. Each store delivery entails the delivery of one or more cartons of products to a customer. Pharmacare's staff stacks cartons directly onto display shelves in customers' stores. Currently, there is no additional charge to the customer for shelf-stocking and not all customers use Pharmacare for this activity. The level of each activity in the three market segments and the total cost incurred for each activity in 2011 is as follows:



	A	B	C	D	E
13					
14	**Activity-based Cost Data**		**Activity Level**		
15	**Pharmacare 2011**	**General**			**Total Cost**
16		**Supermarket**	**Drugstore**	**Mom-and-Pop**	**of Activity**
17	**Activity**	**Chains**	**Chains**	**Single Stores**	**in 2011**
18	Orders processed (number)	140	360	1,500	$ 80,000
19	Line-items ordered (number)	1,960	4,320	15,000	63,840
20	Store deliveries made (number)	120	360	1,000	71,000
21	Cartons shipped to stores (number)	36,000	24,000	16,000	76,000
22	Shelf stocking (hours)	360	180	100	10,240
23					$301,080

Required

1. Compute the 2011 gross-margin percentage for each of Pharmacare's three market segments.
2. Compute the cost driver rates for each of the five activity areas.
3. Use the activity-based costing information to allocate the $301,080 of "other operating costs" to each of the market segments. Compute the operating income for each market segment.
4. Comment on the results. What new insights are available with the activity-based costing information?

5-36 Choosing cost drivers, activity-based costing, activity-based management. Pumpkin Bags (PB) is a designer of high quality backpacks and purses. Each design is made in small batches. Each spring, PB comes out with new designs for the backpack and for the purse. The company uses these designs for a year, and then moves on to the next trend. The bags are all made on the same fabrication equipment that is expected to operate at capacity. The equipment must be switched over to a new design and set up

to prepare for the production of each new batch of products. When completed, each batch of products is immediately shipped to a wholesaler. Shipping costs vary with the number of shipments. Budgeted information for the year is as follows:

Pumpkin Bags
Budget for costs and Activities
For the Year Ended February 28, 2011

Direct materials—purses	$ 379,290
Direct materials—backpacks	412,920
Direct manufacturing labor—purses	98,000
Direct manufacturing labor—backpacks	120,000
Setup	65,930
Shipping	73,910
Design	166,000
Plant utilities and administration	243,000
Total	$1,559,050

Other budget information follows:

	Backpacks	Purses	Total
Number of bags	6,050	3,350	9,400
Hours of production	1,450	2,600	4,050
Number of batches	130	60	190
Number of designs	2	2	4

Required

1. Identify the cost hierarchy level for each cost category.
2. Identify the most appropriate cost driver for each cost category. Explain briefly your choice of cost driver.
3. Calculate the budgeted cost per unit of cost driver for each cost category.
4. Calculate the budgeted total costs and cost per unit for each product line.
5. Explain how you could use the information in requirement 4 to reduce costs.

5-37 ABC, health care. Uppervale Health Center runs two programs: drug addict rehabilitation and aftercare (counseling and support of patients after release from a mental hospital). The center's budget for 2010 follows:

Professional salaries:		
4 physicians × $150,000	$600,000	
12 psychologists × $75,000	900,000	
16 nurses × $30,000	480,000	$1,980,000
Medical supplies		220,000
Rent and clinic maintenance		126,000
Administrative costs to manage patient charts, food, laundry		440,000
Laboratory services		84,000
Total		$2,850,000

Muriel Clayton, the director of the center, is keen on determining the cost of each program. Clayton compiled the following data describing employee allocations to individual programs:

	Drug	Aftercare	Total Employees
Physicians	4		4
Psychologists	4	8	12
Nurses	6	10	16

Clayton has recently become aware of activity-based costing as a method to refine costing systems. She asks her accountant, Huey Deluth, how she should apply this technique. Deluth obtains the following budgeted information for 2010:

	Drug	Aftercare	Total
Square feet of space occupied by each program	9,000	12,000	21,000
Patient-years of service	50	60	110
Number of laboratory tests	1,400	700	2,100

Required

1. **a.** Selecting cost-allocation bases that you believe are the most appropriate for allocating indirect costs to programs, calculate the budgeted indirect cost rates for medical supplies; rent and clinic maintenance; administrative costs for patient charts, food, and laundry; and laboratory services.
   b. Using an activity-based costing approach to cost analysis, calculate the budgeted cost of each program and the budgeted cost per patient-year of the drug program.
   c. What benefits can Uppervale Health Center obtain by implementing the ABC system?
2. What factors, other than cost, do you think Uppervale Health Center should consider in allocating resources to its programs?

5-38 Unused capacity, activity-based costing, activity-based management. Nivag's Netballs is a manufacturer of high quality basketballs and volleyballs. Setup costs are driven by the number of batches. Equipment and maintenance costs increase with the number of machine-hours, and lease rent is paid per square foot. Capacity of the facility is 12,000 square feet and Nivag is using only 70% of this capacity. Nivag records the cost of unused capacity as a separate line item, and not as a product cost. The following is the budgeted information for Nivag:

Nivag's Netballs
Budgeted Costs and Activities
For the Year Ended August 31, 2012

Direct materials—basketballs	$ 209,750
Direct materials—volleyballs	358,290
Direct manufacturing labor—basketballs	107,333
Direct manufacturing labor—volleyballs	102,969
Setup	143,500
Equipment and maintenance costs	109,900
Lease rent	216,000
Total	$1,247,742

Other budget information follows:

	Basketballs	Volleyballs
Number of balls	66,000	100,000
Machine-hours	11,000	12,500
Number of batches	300	400
Square footage of production space used	3,360	5,040

Required

1. Calculate the budgeted cost per unit of cost driver for each indirect cost pool.
2. What is the budgeted cost of unused capacity?
3. What is the budgeted total cost and the cost per unit of resources used to produce (a) basketballs and (b) volleyballs?
4. What factors should Nivag consider if it has the opportunity to manufacture a new line of footballs?

5-39 Activity-based job costing, unit-cost comparisons. The Tracy Corporation has a machining facility specializing in jobs for the aircraft-components market. Tracy's previous simple job-costing system had two direct-cost categories (direct materials and direct manufacturing labor) and a single indirect-cost pool (manufacturing overhead, allocated using direct manufacturing labor-hours). The indirect cost-allocation rate of the simple system for 2010 would have been $115 per direct manufacturing labor-hour.

Recently a team with members from product design, manufacturing, and accounting used an ABC approach to refine its job-costing system. The two direct-cost categories were retained. The team decided to replace the single indirect-cost pool with five indirect-cost pools. The cost pools represent five activity areas at the plant, each with its own supervisor and budget responsibility. Pertinent data are as follows:

Activity Area	Cost-Allocation Base	Cost-Allocation Rate
Materials handling	Parts	$ 0.40
Lathe work	Lathe turns	0.20
Milling	Machine-hours	20.00
Grinding	Parts	0.80
Testing	Units tested	15.00

Information-gathering technology has advanced to the point at which the data necessary for budgeting in these five activity areas are collected automatically.

Two representative jobs processed under the ABC system at the plant in the most recent period had the following characteristics:

	Job 410	Job 411
Direct material cost per job	$ 9,700	$59,900
Direct manufacturing labor cost per job	$750	$11,250
Number of direct manufacturing labor-hours per job	25	375
Parts per job	500	2,000
Lathe turns per job	20,000	59,250
Machine-hours per job	150	1,050
Units per job (all units are tested)	10	200

Required

1. Compute the manufacturing cost per unit for each job under the previous simple job-costing system.
2. Compute the manufacturing cost per unit for each job under the activity-based costing system.
3. Compare the per-unit cost figures for Jobs 410 and 411 computed in requirements 1 and 2. Why do the simple and the activity-based costing systems differ in the manufacturing cost per unit for each job? Why might these differences be important to Tracy Corporation?
4. How might Tracy Corporation use information from its ABC system to better manage its business?

5-40 ABC, implementation, ethics. (CMA, adapted) Applewood Electronics, a division of Elgin Corporation, manufactures two large-screen television models: the Monarch, which has been produced since 2006 and sells for $900, and the Regal, a newer model introduced in early 2009 that sells for $1,140. Based on the following income statement for the year ended November 30, 2010, senior management at Elgin have decided to concentrate Applewood's marketing resources on the Regal model and to begin to phase out the Monarch model because Regal generates a much bigger operating income per unit.

Applewood Electronics
Income Statement
For the Fiscal Year Ended November 30, 2010

	Monarch	Regal	Total
Revenues	$19,800,000	$4,560,000	$24,360,000
Cost of goods sold	12,540,000	3,192,000	15,732,000
Gross margin	7,260,000	1,368,000	8,628,000
Selling and administrative expense	5,830,000	978,000	6,808,000
Operating income	$ 1,430,000	$ 390,000	$ 1,820,000
Units produced and sold	22,000	4,000	
Operating income per unit sold	$65.00	$97.50	

Details for cost of goods sold for Monarch and Regal are as follows:

	Monarch		Regal	
	Total	Per unit	Total	Per unit
Direct materials	$ 4,576,000	$208	$2,336,000	$584
Direct manufacturing labor[a]	396,000	18	168,000	42
Machine costs[b]	3,168,000	144	288,000	72
Total direct costs	$ 8,140,000	$370	$2,792,000	$698
Manufacturing overhead costs[c]	$ 4,400,000	$200	$ 400,000	$100
Total cost of goods sold	$12,540,000	$570	$3,192,000	$798

[a] Monarch requires 1.5 hours per unit and Regal requires 3.5 hours per unit. The direct manufacturing labor cost is $12 per hour.
[b] Machine costs include lease costs of the machine, repairs, and maintenance. Monarch requires 8 machine-hours per unit and Regal requires 4 machine-hours per unit. The machine hour rate is $18 per hour.
[c] Manufacturing overhead costs are allocated to products based on machine-hours at the rate of $25 per hour.

Applewood's controller, Susan Benzo, is advocating the use of activity-based costing and activity-based management and has gathered the following information about the company's manufacturing overhead costs for the year ended November 30, 2010.

	Total Activity	Units of the Cost-Allocation Base		
Activity Center (Cost-Allocation Base)	Costs	Monarch	Regal	Total
Soldering (number of solder points)	$ 942,000	1,185,000	385,000	1,570,000
Shipments (number of shipments)	860,000	16,200	3,800	20,000
Quality control (number of inspections)	1,240,000	56,200	21,300	77,500
Purchase orders (number of orders)	950,400	80,100	109,980	190,080
Machine power (machine-hours)	57,600	176,000	16,000	192,000
Machine setups (number of setups)	750,000	16,000	14,000	30,000
Total manufacturing overhead	$4,800,000			

After completing her analysis, Benzo shows the results to Fred Duval, the Applewood division president. Duval does not like what he sees. "If you show headquarters this analysis, they are going to ask us to phase out the Regal line, which we have just introduced. This whole costing stuff has been a major problem for us. First Monarch was not profitable and now Regal."

"Looking at the ABC analysis, I see two problems. First, we do many more activities than the ones you have listed. If you had included all activities, maybe your conclusions would be different. Second, you used number of setups and number of inspections as allocation bases. The numbers would be different had you used setup-hours and inspection-hours instead. I know that measurement problems precluded you from using these other cost-allocation bases, but I believe you ought to make some adjustments to our current numbers to compensate for these issues. I know you can do better. We can't afford to phase out either product."

Benzo knows that her numbers are fairly accurate. As a quick check, she calculates the profitability of Regal and Monarch using more and different allocation bases. The set of activities and activity rates she had used results in numbers that closely approximate those based on more detailed analyses. She is confident that headquarters, knowing that Regal was introduced only recently, will not ask Applewood to phase it out. She is also aware that a sizable portion of Duval's bonus is based on division revenues. Phasing out either product would adversely affect his bonus. Still, she feels some pressure from Duval to do something.

Required

1. Using activity-based costing, calculate the gross margin per unit of the Regal and Monarch models.
2. Explain briefly why these numbers differ from the gross margin per unit of the Regal and Monarch models calculated using Applewood's existing simple costing system.
3. Comment on Duval's concerns about the accuracy and limitations of ABC.
4. How might Applewood find the ABC information helpful in managing its business?
5. What should Susan Benzo do in response to Duval's comments?

Collaborative Learning Problem

5-41 Activity-based costing, activity-based management, merchandising. Super Bookstore (SB) is a large city bookstore that sells books and music CDs, and has a café. SB operates at capacity and allocates selling, general, and administration (S, G & A) costs to each product line using the cost of merchandise of each product line. SB wants to optimize the pricing and cost management of each product line. SB is wondering if its accounting system is providing it with the best information for making such decisions.

Super Bookstore
Product Line Information
For the Year Ended December 31, 2010

	Books	CDs	Café
Revenues	$3,720,480	$2,315,360	$736,216
Cost of merchandise	$2,656,727	$1,722,311	$556,685
Cost of café cleaning	—	—	$ 18,250
Number of purchase orders placed	2,800	2,500	2,000
Number of deliveries received	1,400	1,700	1,600
Hours of shelf stocking time	15,000	14,000	10,000
Items sold	124,016	115,768	368,108

Super Bookstore incurs the following selling, general, and administration costs:

Super Bookstore
Selling, General, & Administration (S, G & A) Costs
For the Year Ended December 31, 2010

Purchasing department expenses	$ 474,500
Receiving department expenses	432,400
Shelf stocking labor expense	487,500
Customer support expense (cashiers and floor employees)	91,184
	$1,485,584

Required

1. Suppose Super Bookstore uses cost of merchandise to allocate all S, G & A costs. Prepare product line and total company income statements.
2. Identify an improved method for allocating costs to the three product lines. Explain. Use the method for allocating S, G & A costs that you propose to prepare new product line and total company income statements. Compare your results to the results in requirement 1.
3. Write a memo to Super Bookstore's management describing how the improved system might be useful for managing Super Bookstore.