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.

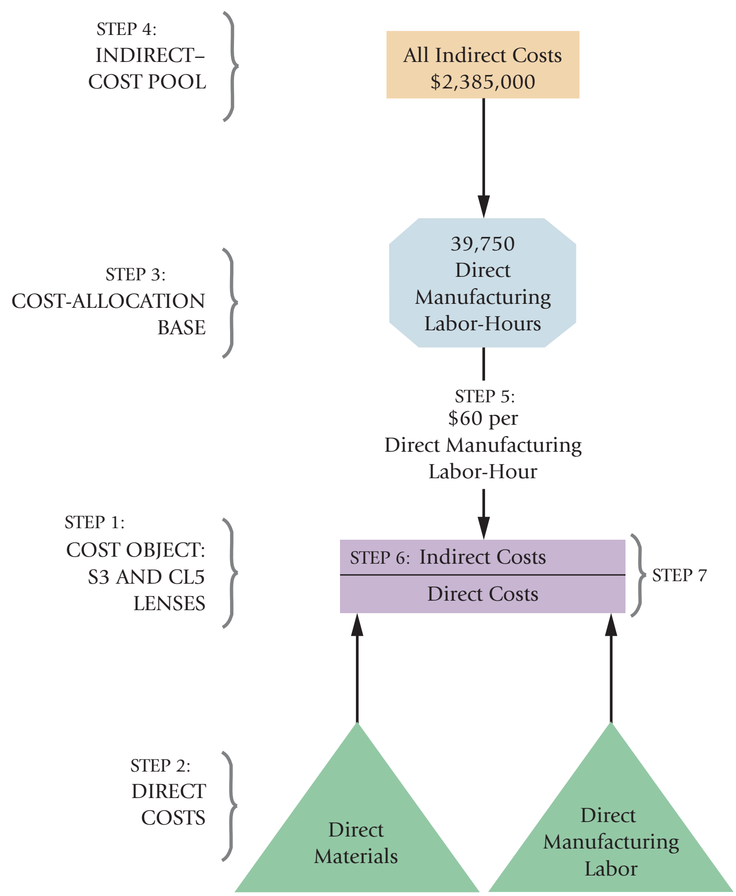
To guide their pricing and cost-management decisions, Plastim's managers assign all costs, both manufacturing and nonmanufacturing, to the S3 and CL5 lenses. If managers had wanted to calculate the cost of inventory, Plastim's management accountants would have assigned only manufacturing costs to the 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?

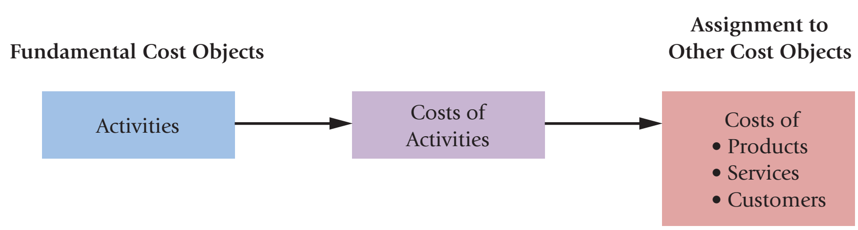
Activity-Based Costing Systems

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.

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[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.

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.

Decision Point

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

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.

Decision Point

What is a cost hierarchy?

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.

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

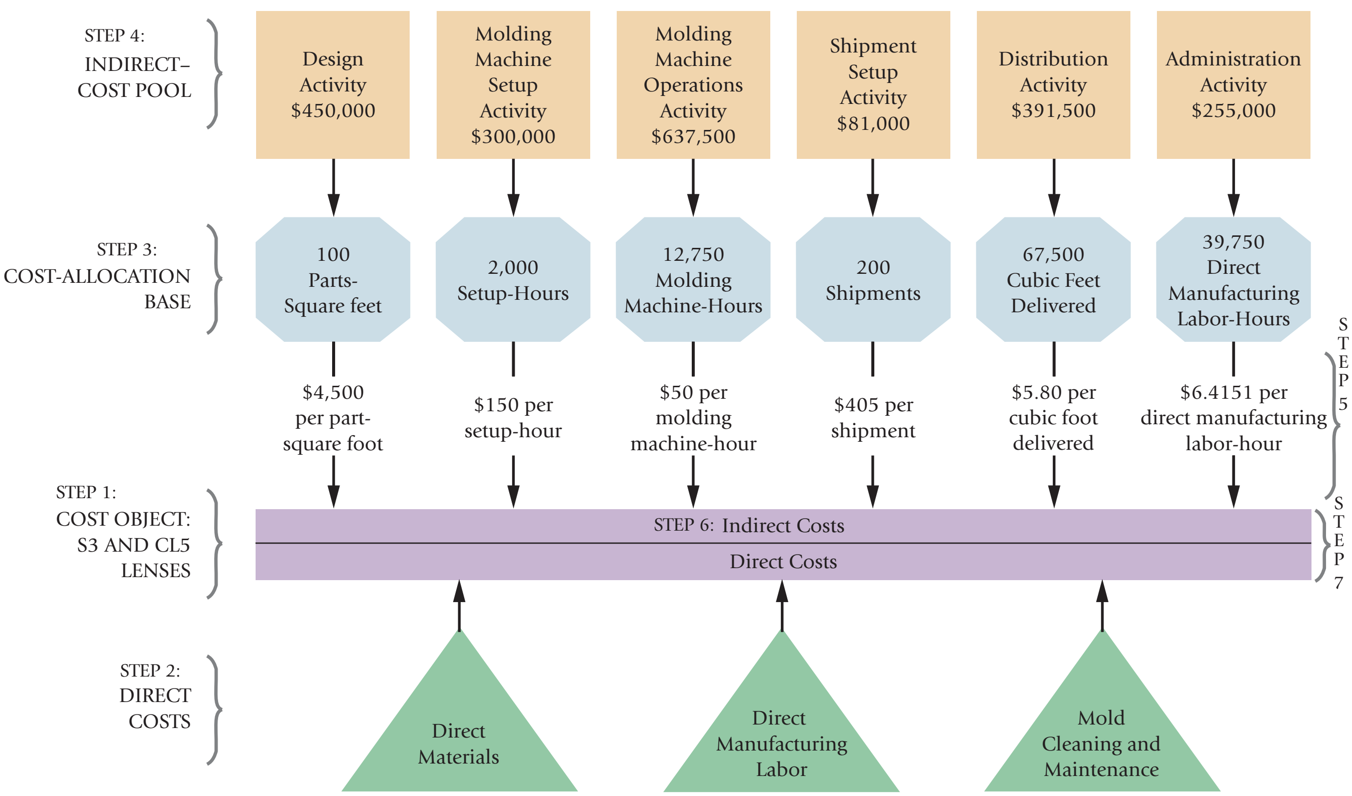

Exhibit 5-4 Activity-Cost Rates for Indirect-Cost Pools

Home Insert Page Layout Formulas Data Review View

	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

	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.

Decision Point

What should managers consider when deciding to implement ABC systems?

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.

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,

Costs incurred = $391,500

Resources used = $216,000 (for S3 lens) + $108,000 (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.