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/; Yoon-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.

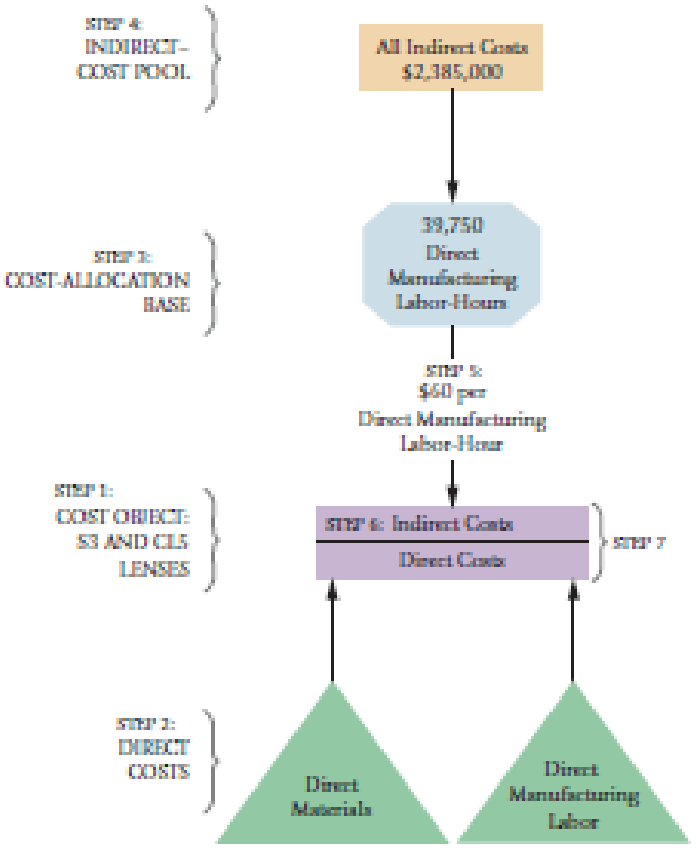
In computing costs, Plastim assigns both variable costs and costs that are fixed in the short run to the S3 and CL5 lenses. Managers cost products and services to guide long-run strategic decisions (for example, what mix of products and services to produce and sell and what prices to charge for them).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

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	A	B	C	D	E	F	G
1		60,000			15,000		
2		Simple Lenses (S3)			Complex Lenses (CL5)		
3		Total	per Unit		Total	per Unit	Total
4		(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.