12 Pricing Decisions and Cost Management

Learning Objectives

1. Discuss the three major influences on pricing decisions
2. Understand how companies make short-run pricing decisions
3. Understand how companies make long-run pricing decisions
4. Price products using the target-costing approach
5. Apply the concepts of cost incurrence and locked-in costs
6. Price products using the cost-plus approach
7. Use life-cycle budgeting and costing when making pricing decisions
8. Describe two pricing practices in which noncost factors are important when setting prices
9. Explain the effects of antitrust laws on pricing

Most companies make a tremendous effort to analyze their costs and prices.

They know if the price is too high, customers will look elsewhere, too low, and the firm won't be able to cover the cost of making the product. Some companies, however, understand that it is possible to charge a low price to stimulate demand and meet customer needs while relentlessly managing costs to earn a profit. Tata Motors is one such company.

Target Pricing and Tata Motors' $2,500 Car[1]

Despite India's rapid economic growth and growing market for consumer goods, transportation options in the world's most populous country remain limited. Historically, Indians relied on public transportation, bicycles, and motorcycles to get around. Less than 1% owned cars, with most foreign models ill-suited to India's unique traffic conditions. Most cars had unnecessary product features and were priced too high for the vast majority of Indians.

But Ratan Tata, chairman of India's Tata Motors, saw India's dearth of cars as an opportunity. In 2003, after seeing a family riding dangerously on a two-wheel scooter, Mr. Tata set a challenge for his company to build a 'people's car' for the Indian market with three requirements: It should (1) adhere to existing regulatory requirements, (2) achieve certain performance targets for fuel efficiency and acceleration, and (3) cost only $2,500, about the price of the optional DVD player in a new Lexus sport utility vehicle sold in the United States.

The task was daunting: $2,500 was about half the price of the cheapest Indian car. One of Tata's suppliers said, "It's basically throwing out everything the auto industry has thought about cost structures in the past and taking a clean sheet of paper and asking, 'What's possible?'" Mr. Tata and his managers responded with what some analysts have described as "Gandhian engineering"

[1] *Sources*: Giridharadas, Anand. 2008. Four wheels for the masses: The $2,500 car. *New York Times*, January 8. http://www.nytimes.com/2008/01/08/business/worldbusiness/08indiacar.html Kripalani, Manjeet. 2008. Inside the Tata Nano Factory. *BusinessWeek*, May 9. http://www.businessweek.com/print/innovate/content/may2008/id2008059_312111.htm

principles: deep frugality with a willingness to challenge conventional wisdom.

At a fundamental level, Tata Motors' engineers created a new category of car by doing more with less. Extracting costs from traditional car development, Tata eschewed traditional long-term supplier relationships, and instead forced suppliers to compete for its business using Internet-based auctions. Engineering innovations led to a hollowed-out steering-wheel shaft, a smaller diameter drive shaft, a trunk with space for a briefcase, one windshield wiper instead of two, and a rear-mounted engine not much more powerful than a high-end riding lawnmower. Moreover, Tata's car has no radio, no power steering, no power windows, and no air conditioning—features standard on most vehicles.

But when Tata Motors introduced the "Nano" in 2008, the company had successfully built a $2,500 entry-level car that is fuel efficient, 50 miles to the gallon; reaches 65 miles per hour; and meets all current Indian emission, pollution, and safety standards. While revolutionizing the Indian automotive marketplace, the "Nano" is also changing staid global automakers. Already, the French-Japanese alliance Renault-Nissan and the Indian-Japanese joint venture Maruti Suzuki are trying to make ultra-cheap cars for India, while Ford recently made India the manufacturing hub for all of its low-cost cars.

Just like Ratan Tata, managers at many innovative companies are taking a fresh look at their strategic pricing decisions. This chapter describes how managers evaluate demand at different prices and manage costs across the value chain and over a product's life cycle to achieve profitability.

Major Influences on Pricing Decisions

Learning Objective 1

Discuss the three major influences on pricing decisions

. . . customers, competitors, and costs

Consider for a moment how managers at Adidas might price their newest line of sneakers, or how decision makers at Microsoft would determine how much to charge for a monthly subscription of MSN Internet service. How companies price a product or a service ultimately depends on the demand and supply for it. Three influences on demand and supply are customers, competitors, and costs.

Customers, Competitors, and Costs

Customers

Customers influence price through their effect on the demand for a product or service, based on factors such as the features of a product and its quality. As the Tata Motors example illustrates, companies must always examine pricing decisions through the eyes of their customers and then manage costs to earn a profit.

Competitors

No business operates in a vacuum. Companies must always be aware of the actions of their competitors. At one extreme, alternative or substitute products of competitors hurt demand and force a company to lower prices. At the other extreme, a company without a competitor is free to set higher prices. When there are competitors, companies try to learn about competitors' technologies, plant capacities, and operating strategies to estimate competitors' costs—valuable information when setting prices.

Because competition spans international borders, fluctuations in exchange rates between different countries' currencies affect costs and pricing decisions. For example, if the yen weakens against the U.S. dollar, Japanese products become cheaper for American consumers and, consequently, more competitive in U.S. markets.

Costs

Costs influence prices because they affect supply. The lower the cost of producing a product, the greater the quantity of product the company is willing to supply. Generally, as companies increase supply, the cost of producing an additional unit initially declines but eventually increases. Companies supply products as long as the revenue from selling additional units exceeds the cost of producing them. Managers who understand the cost of producing products set prices that make the products attractive to customers while maximizing operating income.

Weighing Customers, Competitors, and Costs

Surveys indicate that companies weigh customers, competitors, and costs differently when making pricing decisions. At one extreme, companies operating in a perfectly competitive market sell very similar commodity-type products, such as wheat, rice, steel, and aluminum. These companies have no control over setting prices and must accept the price determined by a market consisting of many participants. Cost information is only helpful in deciding the quantity of output to produce to maximize operating income.

In less-competitive markets, such as those for cameras, televisions, and cellular phones, products are differentiated, and all three factors affect prices: The value customers place on a product and the prices charged for competing products affect demand, and the costs of producing and delivering the product influence supply.

Decision Point

What are the three major influences on pricing decisions?

As competition lessens even more, the key factor affecting pricing decisions is the customer's willingness to pay based on the value that customers place on the product or service, not costs or competitors. In the extreme, there are monopolies. A monopolist has no competitors and has much more leeway to set high prices. Nevertheless, there are limits. The higher the price a monopolist sets, the lower the demand for the monopolist's product as customers seek substitute products.

Costing and Pricing for the Short Run

Short-run pricing decisions typically have a time horizon of less than a year and include decisions such as (a) pricing a *one-time-only special order* with no long-run implications and (b) adjusting product mix and output volume in a competitive market. Long-run

pricing decisions have a time horizon of a year or longer and include pricing a product in a market where there is some leeway in setting price.

Consider a short-run pricing decision facing the management team at Astel Computers. Astel manufactures two brands of personal computers (PCs)—Deskpoint, Astel's top-of-the-line product, and Provalue, a less-powerful Pentium chip-based machine. Datatech Corporation has asked Astel to bid on supplying 5,000 Provalue computers over the last three months of 2010. After this three-month period, Datatech is unlikely to place any future sales orders with Astel. Datatech will sell Provalue computers under its own brand name in regions and markets where Astel does not sell Provalue. Whether Astel accepts or rejects this order will not affect Astel's revenues—neither the units sold nor the selling price—from existing sales channels.

Learning Objective 2

Understand how companies make short-run pricing decisions

. . . consider only incremental costs as relevant and price opportunistically to respond to demand and competition

Relevant Costs for Short-Run Pricing Decisions

Before Astel can bid on Datatech's offer, Astel's managers must estimate how much it will cost to supply the 5,000 computers. Similar to the Surf Gear example in Chapter 11, the relevant costs Astel's managers must focus on include all direct and indirect costs throughout the value chain that will change in total by accepting the one-time-only special order from Datatech. Astel's managers outline the relevant costs as follows:

Direct materials ($460 per computer × 5,000 computers)	$2,300,000
Direct manufacturing labor ($64 per computer × 5,000 computers)	320,000
Fixed costs of additional capacity to manufacture Provalue	250,000
Total costs	$2,870,000*

*No additional costs will be required for R&D, design, marketing, distribution, or customer service.

The relevant cost per computer is $574 ($2,870,000 ÷ 5,000). Therefore, any selling price above $574 will improve Astel's profitability in the short run. What price should Astel's managers bid for the 5,000-computer order?

Strategic and Other Factors in Short-Run Pricing

Based on its market intelligence, Astel believes that competing bids will be between $596 and $610 per computer, so Astel makes a bid of $595 per computer. If it wins this bid, operating income will increase by $105,000 (relevant revenues, $595 × 5,000 = $2,975,000 minus relevant costs, $2,870,000). In light of the extra capacity and strong competition, management's strategy is to bid as high above $574 as possible while remaining lower than competitors' bids.

What if Astel were the only supplier and Datatech could undercut Astel's selling price in Astel's current markets? The relevant cost of the bidding decision would then include the contribution margin lost on sales to existing customers. What if there were many parties eager to bid and win the Datatech contract? In this case, the contribution margin lost on sales to existing customers would be irrelevant to the decision because the existing business would be undercut by Datatech regardless of whether Astel wins the contract.

In contrast to the Astel case, in some short-run situations, a company may experience strong demand for its products or have limited capacity. In these circumstances, a company will strategically increase prices in the short run to as much as the market will bear. We observe high short-run prices in the case of new products or new models of older products, such as microprocessors, computer chips, cellular telephones, and software.

Effect of Time Horizon on Short-Run Pricing Decisions

Two key factors affect short-run pricing.

1. Many costs are irrelevant in short-run pricing decisions. In the Astel example, most of Astel's costs in R&D, design, manufacturing, marketing, distribution, and customer service are irrelevant for the short-run pricing decision, because these costs will not

Decision Point

What do companies consider when making short-run pricing decisions?

change whether Astel wins or does not win the Datatech business. These costs will change in the long run and therefore will be relevant.

2. Short-run pricing is opportunistic. Prices are decreased when demand is weak and competition is strong and increased when demand is strong and competition is weak. As we will see, long-run prices need to be set to earn a reasonable return on investment.

Costing and Pricing for the Long Run

Learning Objective 3

Understand how companies make long-run pricing decisions

Consider all future variable and fixed costs as relevant and earn a target return on investment

Long-run pricing is a strategic decision designed to build long-run relationships with customers based on stable and predictable prices. A stable price reduces the need for continuous monitoring of prices, improves planning, and builds long-run buyer–seller relationships. But to charge a stable price and earn the target long-run return, a company must, over the long run, know and manage its costs of supplying products to customers. As we will see, relevant costs for long-run pricing decisions include *all* future fixed and variable costs.

Calculating Product Costs for Long-Run Pricing Decisions

Let's return to the Astel example. However, this time consider the long-run pricing decision for Provalue.

We start by reviewing data for the year just ended, 2011. Astel has no beginning or ending inventory of Provalue and manufactures and sells 150,000 units during the year. Astel uses activity-based costing (ABC) to calculate the manufacturing cost of Provalue. Astel has three direct manufacturing costs, direct materials, direct manufacturing labor, and direct machining costs, and three manufacturing overhead cost pools, ordering and receiving components, testing and inspection of final products, and rework (correcting and fixing errors and defects), in its accounting system. Astel treats machining costs as a direct cost of Provalue because Provalue is manufactured on machines that only make Provalue.[2]

Astel uses a long-run time horizon to price Provalue. Over this horizon, Astel's managers observe the following:

- Direct material costs vary with number of units of Provalue produced.
- Direct manufacturing labor costs vary with number of direct manufacturing labor-hours used.
- Direct machining costs are fixed costs of leasing 300,000 machine-hours of capacity over multiple years. These costs do not vary with the number of machine-hours used each year. Each unit of Provalue requires 2 machine-hours. In 2011, Astel uses the entire machining capacity to manufacture Provalue (2 machine-hours per unit × 150,000 units = 300,000 machine-hours).
- Ordering and receiving, testing and inspection, and rework costs vary with the quantity of their respective cost drivers. For example, ordering and receiving costs vary with the number of orders. In the long run, staff members responsible for placing orders can be reassigned or laid off if fewer orders need to be placed, or increased if more orders need to be processed.

The following Excel spreadsheet summarizes manufacturing cost information to produce 150,000 units of Provalue in 2011.

[2] Recall that Astel makes two types of PCs: Deskpoint and Provalue. If Deskpoint and Provalue had shared the same machines, Astel would have allocated machining costs on the basis of the budgeted machine-hours used to manufacture the two products and would have treated these costs as fixed overhead costs.

Home Insert Page Layout Formulas Data Review View

	A	B	C	D	E	F	G	H
1		Manufacturing Cost Information						
2		to Produce 150,000 Units of Provalue						
3	**Cost Category**	**Cost Driver**	**Details of Cost Driver Quantities**				**Total Quantity of Cost Driver**	**Cost per Unit of Cost Driver**
4	**(1)**	**(2)**	**(3)**		**(4)**		**(5) = (3) × (4)**	**(6)**
5	**Direct Manufacturing Costs**							
6	Direct materials	No. of kits	1	kit per unit	150,000	units	150,000	$460
7	Direct manufacturing labor (DML)	DML hours	3.2	DML hours per unit	150,000	units	480,000	$ 20
8	Direct machining (fixed)	Machine-hours					300,000	$ 38
9	**Manufacturing Overhead Costs**							
10	Ordering and receiving	No. of orders	50	orders per component	450	components	22,500	$ 80
11	Testing and inspection	Testing-hours	30	testing-hours per unit	150,000	units	4,500,000	$ 2
12	Rework				8%	defect rate		
13		Rework-hours	2.5	rework-hours per defective unit	12,000[a]	defective units	30,000	$ 40
14								
15	[a]8% defect rate × 150,000 units = 12,000 defective units							

Exhibit 12-1 indicates that the total cost of manufacturing Provalue in 2011 is $102 million, and the manufacturing cost per unit is $680. Manufacturing, however, is just one business function in the value chain. To set long-run prices, Astel's managers must calculate the *full cost* of producing and selling Provalue.

For each nonmanufacturing business function, Astel's managers trace direct costs to products and allocate indirect costs using cost pools and cost drivers that measure cause-and-effect relationships (supporting calculations not shown). Exhibit 12-2 summarizes Provalue's 2011 operating income and shows that Astel earned $15 million from Provalue, or $100 per unit sold in 2011.

Alternative Long-Run Pricing Approaches

How should managers at Astel use product cost information to price Provalue in 2012? Two different approaches for pricing decisions are as follows:

1. Market-based
2. Cost-based, which is also called cost-plus

The market-based approach to pricing starts by asking, "Given what our customers want and how our competitors will react to what we do, what price should we charge?" Based on this price, managers control costs to earn a target return on investment. The cost-based approach to pricing starts by asking, "Given what it costs us to make this product, what price should we charge that will recoup our costs and achieve a target return on investment?"

Exhibit 12-1 Manufacturing Costs of Provalue for 2011 Using Activity-Based Costing

	A	B	C
1		**Total Manufacturing**	
2		**Costs for**	**Manufacturing**
3		**150,000 Units**	**Cost per Unit**
4		**(1)**	**(2) = (1) ÷ 150,000**
5	Direct manufacturing costs		
6	Direct material costs		
7	(150,000 kits × $460 per kit)	$ 69,000,000	$460
8	Direct manufacturing labor costs		
9	(480,000 DML-hours × $20 per hour)	9,600,000	64
10	Direct machining costs		
11	(300,000 machine-hours × $38 per machine-hour)	11,400,000	76
12	Direct manufacturing costs	90,000,000	600
13			
14	Manufacturing overhead costs		
15	Ordering and receiving costs		
16	(22,500 orders × $80 per order)	1,800,000	12
17	Testing and inspection costs		
18	(4,500,000 testing-hours × $2 per hour)	9,000,000	60
19	Rework costs		
20	(30,000 rework-hours × $40 per hour)	1,200,000	8
21	Manufacturing overhead cost	12,000,000	80
22	Total manufacturing costs	$102,000,000	$680

Exhibit 12-2 Product Profitability of Provalue for 2011 Using Value-Chain Activity-Based Costing

	A	B	C
1		**Total Amounts**	
2		**for 150,000 Units**	**Per Unit**
3		**(1)**	**(2) = (1) ÷ 150,000**
4	Revenues	$150,000,000	$1,000
5	Costs of goods sold[a] (from Exhibit 12-1)	102,000,000	680
6	Operating costs[b]		
7	R&D costs	5,400,000	36
8	Design cost of product and process	6,000,000	40
9	Marketing costs	15,000,000	100
10	Distribution costs	3,600,000	24
11	Customer-service costs	3,000,000	20
12	Operating costs	33,000,000	220
13	Full cost of the product	135,000,000	900
14	Operating income	$ 15,000,000	$ 100
15			
16	[a]Cost of goods sold = Total manufacturing costs because there is no beginning or ending inventory		
17	of Provalue in 2011		
18	[b]Numbers for operating cost line-items are assumed without supporting calculations		

Companies operating in *competitive* markets (for example, commodities such as steel, oil, and natural gas) use the market-based approach. The items produced or services provided by one company are very similar to items produced or services provided by others. Companies in these markets must accept the prices set by the market.

Companies operating in *less competitive* markets offer products or services that differ from each other (for example, automobiles, computers, management consulting, and legal services), can use either the market-based or cost-based approach as the starting point for pricing decisions. Some companies first look at costs because cost information is more easily available and then consider customers or competitors: the cost-based approach. Others start by considering customers and competitors and then look at costs: the market-based approach. Both approaches consider customers, competitors, and costs. Only their starting points differ. Management must always keep in mind market forces, regardless of which pricing approach it uses. For example, building contractors often bid on a cost-plus basis but then reduce their prices during negotiations to respond to other lower-cost bids.

Companies operating in markets that are *not competitive* favor cost-based approaches. That's because these companies do not need to respond or react to competitors' prices. The margin they add to costs to determine price depends on the value customers place on the product or service.

We consider first the market-based approach.

Decision Point

How do companies make long-run pricing decisions?

Target Costing for Target Pricing

Learning Objective 4

Price products using the target-costing approach

. . . target costing identifies an estimated price customers are willing to pay and then computes a target cost to earn the desired profit

Market-based pricing starts with a target price. A **target price** is the estimated price for a product or service that potential customers are willing to pay. This estimate is based on an understanding of customers' perceived value for a product or service and how competitors will price competing products or services. This understanding of customers and competitors is becoming increasingly important for three reasons:

1. Competition from lower-cost producers is continually restraining prices.
2. Products are on the market for shorter periods of time, leaving less time and opportunity to recover from pricing mistakes, loss of market share, and loss of profitability.
3. Customers are becoming more knowledgeable and incessantly demanding products of higher and higher quality at lower and lower prices.

Understanding Customers' Perceived Value

A company's sales and marketing organization, through close contact and interaction with customers, identifies customer needs and perceptions of product value. Companies such as Apple also conduct market research on features that customers want and the prices they are willing to pay for those features for products such as the iPhone and the Macintosh computer.

Doing Competitor Analysis

To gauge how competitors might react to a prospective price, a company must understand competitors' technologies, products or services, costs, and financial conditions. In general, the more distinctive its product or service, the higher the price a company can charge. Where do companies like Ford Motors or PPG Industries obtain information about their competitors? Usually from former customers, suppliers, and employees of competitors. Another source of information is *reverse engineering*—that is, disassembling and analyzing competitors' products to determine product designs and materials and to become acquainted with the technologies competitors use. At no time should a company resort to illegal or unethical means to obtain information about competitors. For example, a company should never pay off current employees or pose as a supplier or customer in order to obtain competitor information.

Implementing Target Pricing and Target Costing

There are five steps in developing target prices and target costs. We illustrate these steps using our Provalue example.

Step 1: Develop a product that satisfies the needs of potential customers. Customer requirements and competitors' products dictate the product features and design modifications for Provalue for 2012. Astel's market research indicates that customers do not value Provalue's extra features, such as special audio features and designs that accommodate upgrades to make the PC run faster. They want Astel to redesign Provalue into a no-frills but reliable PC and to sell it at a much lower price.

Step 2: Choose a target price. Astel expects its competitors to lower the prices of PCs that compete with Provalue to $850. Astel's management wants to respond aggressively, reducing Provalue's price by 20%, from $1,000 to $800 per unit. At this lower price, Astel's marketing manager forecasts an increase in annual sales from 150,000 to 200,000 units.

Step 3: Derive a target cost per unit by subtracting target operating income per unit from the target price. **Target operating income per unit** is the operating income that a company aims to earn per unit of a product or service sold. **Target cost per unit** is the estimated long-run cost per unit of a product or service that enables the company to achieve its target operating income per unit when selling at the target price.[3] *Target cost per unit* is the target price minus *target operating income per unit* and is often lower than the existing *full cost of the product*. Target cost per unit is really just that—a target—something the company must commit to achieve.

To attain the target return on the capital invested in the business, Astel's management needs to earn 10% target operating income on target revenues.

Total target revenues	= $800 per unit × 200,000 units = $160,000,000
Total target operating income	= 10% × $160,000,000 = $16,000,000
Target operating income per unit	= $16,000,000 ÷ 200,000 units = $80 per unit
Target cost per unit	= Target price – Target operating income per unit
	= $800 per unit – $80 per unit = $720 per unit
Total current full costs of Provalue	= $135,000,000 (from Exhibit 12-2)
Current full cost per unit of Provalue	= $135,000,000 ÷ 150,000 units = $900 per unit

Provalue's $720 target cost per unit is $180 below its existing $900 unit cost. Astel must reduce costs in all parts of the value chain—from R&D to customer service—including achieving lower prices on materials and components, while maintaining quality.

Target costs include *all* future costs, variable costs and costs that are fixed in the short run, because in the long run, a company's prices and revenues must recover all its costs if it is to remain in business. Contrast relevant costs for long-run pricing decisions (all variable and fixed costs) with relevant costs for short-run pricing decisions (costs that change in the short run, mostly but not exclusively variable costs).

Step 4: Perform cost analysis. This step analyzes the specific aspects of a product or service to target for cost reduction. Astel's managers focus on the following elements of Provalue:

- The functions performed by and the current costs of different component parts, such as the motherboard, disc drives, and the graphics and video cards.
- The importance that customers place on different product features. For example, Provalue's customers value reliability more than video quality.
- The relationship and tradeoffs across product features and component parts. For example, choosing a simpler mother board enhances reliability but is unable to support the top-of-the-line video card.

[3] For a more-detailed discussion of target costing, see S. Ansari, J. Bell, and The CAM-I Target Cost Core Group, *Target Costing: The Next Frontier in Strategic Cost Management* (Martinsville, IN: Mountain Valley Publishing, 2009). For implementation information, see S. Ansari, L. D. Swenson, and J. Bell, "A Template for Implementing Target Costing," *Cost Management* (September–October 2006): 20–27.

Concepts in Action

Extreme Target Pricing and Cost Management at IKEA

Around the world, IKEA has exploded into a furniture-retailing-industry phenomenon. Known for products named after small Swedish towns, modern design, flat packaging, and do-it-yourself instructions, IKEA has grown from humble beginnings to become the world's largest furniture retailer with 301 stores in 38 countries. How did this happen? Through aggressive target pricing, coupled with relentless cost management. IKEA's prices typically run 30%–50% below its competitors' prices. Moreover, while the prices of other companies' products rise over time, IKEA says it has reduced its retail prices by about 20% over the last four years.

During the conceptualization phase, product developers identify gaps in IKEA's current product portfolio. For example, they might identify the need to create a new flat-screen-television stand. "When we decide about a product, we always start with the consumer need" IKEA Product Developer June Deboehmler said. Second, product developers and their teams survey competitors to determine how much they charge for similar items, if offered, and then select a target price that is 30%–50% less than the competitor's price. With a product and price established, product developers then determine what materials will be used and what manufacturer will do the assembly work—all before the new item is fully designed. For example, a brief describing a new couch's target cost and basic specifications like color and style is submitted for bidding among IKEA's over 1,800 suppliers in more than 50 countries. Suppliers vie to offer the most attractive bid based on price, function, and materials to be used. This value-engineering process promotes volume-based cost efficiencies throughout the design and production process.

Aggressive cost management does not stop there. All IKEA products are designed to be shipped unassembled in flat packages. The company estimates that shipping costs would be at least six times greater if all products were assembled before shipping. To ensure that shipping costs remain low, packaging and shipping technicians work with product developers throughout the product development process. When IKEA recently designed its Lillberg chair, a packaging technician made a small tweak in the angle of the chair's arm. This change allowed more chairs to fit into a single shipping container, which meant a lower cost to the consumer.

What about products that have already been developed? IKEA applies the same cost management techniques to those products, too. For example, one of IKEA's best selling products is the Lack bedside table, which has retailed for the same low price since 1981. How is this possible, you may ask. Since hitting store shelves, more than 100 technical development projects have been performed on the Lack table. Despite the steady increase in the cost of raw materials and wages, IKEA has aggressively sought to reduce product and distribution costs to maintain the Lack table's initial retail price without jeopardizing the company's profit on the product.

As founder Ingvar Kamprad once summarized, "Waste of resources is a mortal sin at IKEA. Expensive solutions are a sign of mediocrity, and an idea without a price tag is never acceptable."

Sources: Baraldi, Enrico and Torkel Strömsten. 2009. Managing product development the IKEA way. Using target costing in inter-organizational networks. Working Paper, December. Margonelli, Lisa. 2002. How IKEA designs its sexy price tags. *Business 2.0,* October. Terdiman, Daniel. 2008. Anatomy of an IKEA product. CNET News.com, April 19.

Step 5: Perform value engineering to achieve target cost. **Value engineering** is a systematic evaluation of all aspects of the value chain, with the objective of reducing costs and achieving a quality level that satisfies customers. As we describe next, value engineering encompasses improvements in product designs, changes in materials specifications, and modifications in process methods. (See the Concepts in Action feature to learn about IKEA's approach to target pricing and target costing.)

Decision Point

How do companies determine target costs?

Value Engineering, Cost Incurrence, and Locked-In Costs

Learning Objective 5

Apply the concepts of cost incurrence

. . . when resources are consumed

and locked-in costs

. . . when resources are committed to be incurred in the future

To implement value engineering, managers distinguish value-added activities and costs from nonvalue-added activities and costs. A **value-added cost** is a cost that, if eliminated, would reduce the actual or perceived value or utility (usefulness) customers experience from using the product or service. Examples are costs of specific product features and attributes desired by customers, such as reliability, adequate memory, preloaded software, clear images, and, in the case of Provalue, prompt customer service.

A **nonvalue-added cost** is a cost that, if eliminated, would not reduce the actual or perceived value or utility (usefulness) customers gain from using the product or service. It is a cost that the customer is unwilling to pay for. Examples of nonvalue-added costs are costs of producing defective products and cost of machine breakdowns. Successful companies keep nonvalue-added costs to a minimum.

Activities and their costs do not always fall neatly into value-added or nonvalue-added categories. Some costs, such as supervision and production control, fall in a gray area because they include mostly value-added but also some nonvalue-added components. Despite these troublesome gray areas, attempts to distinguish value-added from nonvalue-added costs provide a useful overall framework for value engineering.

In the Provalue example, direct materials, direct manufacturing labor, and direct machining costs are value-added costs. Ordering, receiving, testing, and inspection costs fall in the gray area. Rework costs are nonvalue-added costs.

Through value engineering, Astel's managers plan to reduce, and possibly eliminate, nonvalue-added costs and increase the efficiency of value-added activities. They start by distinguishing cost incurrence from locked-in costs. **Cost incurrence** describes when a resource is consumed (or benefit forgone) to meet a specific objective. Costing systems measure cost incurrence. Astel, for example, recognizes direct material costs of Provalue as each unit of Provalue is assembled and sold. But Provalue's direct material cost per unit is *locked in*, or *designed in*, much earlier, when product designers choose Provalue's components. **Locked-in costs**, or **designed-in costs**, are costs that have not yet been incurred but, based on decisions that have already been made, will be incurred in the future.

To manage costs well, a company must identify how design choices lock in costs *before* the costs are incurred. For example, scrap and rework costs incurred during manufacturing are often locked in much earlier by faulty design. Similarly, in the software industry, costly and difficult-to-fix errors that appear during coding and testing are frequently locked in by bad software design and analysis.

Exhibit 12-3 illustrates the locked-in cost curve and the cost-incurrence curve for Provalue. The bottom curve uses information from Exhibit 12-2 to plot the cumulative cost per unit incurred across different business functions of the value chain. The top curve plots how cumulative costs are locked in. (The specific numbers underlying this curve are not presented.) Total cumulative cost per unit for both curves is $900. *Observe, however, the wide divergence between when costs are locked in and when they are incurred*. For example, product design decisions lock in more than 86% ($780 ÷ $900) of the unit cost of Provalue (for example, direct materials, ordering, testing, rework, distribution, and customer service), when only about 8% ($76 ÷ $900) of the unit cost is actually incurred!

Value-Chain Analysis and Cross-Functional Teams

A cross-functional value-engineering team consisting of marketing managers, product designers, manufacturing engineers, purchasing managers, suppliers, dealers, and management accountants redesign Provalue to reduce costs while retaining features that customers value. Some of the team's ideas are as follows:

- Use a simpler, more-reliable motherboard without complex features to reduce manufacturing and repair costs.
- Snap-fit rather than solder parts together to decrease direct manufacturing labor-hours and related costs.

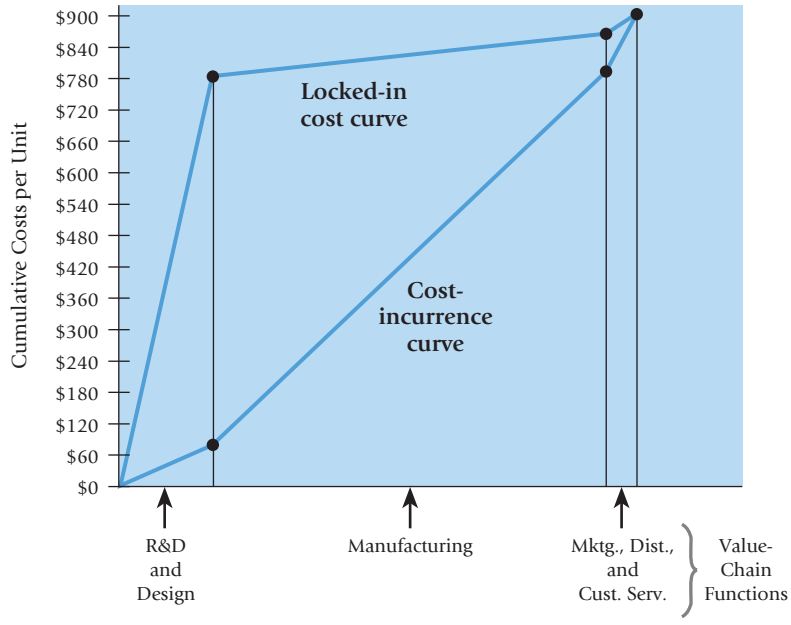


Exhibit 12-3

Pattern of Cost Incurrence and Locked-In Costs for Provalue

- Use fewer components to decrease ordering, receiving, testing, and inspection costs.
- Make Provalue lighter and smaller to reduce distribution and packaging costs.

Management accountants use their understanding of the value chain to estimate cost savings.

Not all costs are locked in at the design stage. Managers always have opportunities to reduce costs by improving operating efficiency and productivity. *Kaizen*, or *continuous improvement*, seeks to reduce the time it takes to do a task and to eliminate waste during production and delivery of products.

In summary, the key steps in value-engineering are as follows:

1. Understanding customer requirements, value-added and nonvalue-added costs
2. Anticipating how costs are locked in before they are incurred
3. Using cross-functional teams to redesign products and processes to reduce costs while meeting customer needs

Achieving the Target Cost per Unit for Provalue

Exhibit 12-4 uses an activity-based approach to compare cost-driver quantities and rates for the 150,000 units of Provalue manufactured and sold in 2011 and the 200,000 units of Provalue II budgeted for 2012. Value engineering decreases both value-added costs (by designing Provalue II to reduce direct materials and component costs, direct manufacturing labor-hours, and testing-hours) and nonvalue-added costs (by simplifying Provalue II's design to reduce rework). Value engineering also reduces the machine-hours required to make Provalue II to 1.5 hours per unit. Astel can now use the 300,000 machine-hours of capacity to make 200,000 units of Provalue II (versus 150,000 units for Provalue) reducing machining cost per unit. For simplicity, we assume that value engineering will not reduce the $20 cost per direct manufacturing labor-hour, the $80 cost per order, the $2 cost per testing-hour, or the $40 cost per rework-hour. (The Problem for Self-Study, p. 452, explores how value engineering can also reduce these cost-driver rates.)

Exhibit 12-5 presents the target manufacturing costs of Provalue II, using cost driver and cost-driver rate data from Exhibit 12-4. For comparison, Exhibit 12-5 also shows the actual 2011 manufacturing cost per unit of Provalue from Exhibit 12-1. Astel's managers expect the new design to reduce total manufacturing cost per unit by $140 (from $680 to $540) and cost per unit in other business functions from $220 (Exhibit 12-2) to $180 (calculations not shown) at the budgeted sales quantity of 200,000 units. The budgeted full unit cost of Provalue II is $720 ($540 + $180), the target cost per unit. At the end of 2012,

Exhibit 12-4 Cost-Driver Quantities and Rates for Provalue in 2011 and Provalue II for 2012 Using Activity-Based Costing

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1			Manufacturing Cost Information for 150,000 Units of Provalue in 2011						Manufacturing Cost Information for 200,000 Units of Provalue II for 2012					
2														
3	Cost Category	Cost Driver	Details of Actual Cost Driver Quantities				Actual Total Quantity of Cost Driver	Actual Cost per Unit of Cost Driver (p.437)	Details of Budgeted Cost Driver Quantities				Budgeted Total Quantity of Cost Driver	Budgeted Cost per Unit of Cost Driver (Given)
4	(1)	(2)	(3)		(4)		(5)=(3)×(4)	(6)	(7)		(8)		(9)=(7)×(8)	(10)
5	**Direct Manufacturing Costs**													
6	Direct materials	No. of kits	1	kit per unit	150,000	units	150,000	$460	1	kit per unit	200,000	units	200,000	$385
7	Direct manuf. labor (DML)	DML hours	3.2	DML hours per unit	150,000	units	480,000	$ 20	2.65	DML hours per unit	200,000	units	530,000	$ 20
8	Direct machining (fixed)	Machine-hours					300,000	$ 38					300,000	$ 38
9	**Manufacturing Overhead Costs**													
10	Ordering and receiving	No. of orders	50	orders per component	450	compo-nents	22,500	$ 80	50	orders per compo-nent	425	compo-nents	21,250	$ 80
11	Testing and inspection	Testing-hours	30	testing-hours per unit	150,000	units	4,500,000	$ 2	15	testing hours per unit	200,000	units	3,000,000	$ 2
12	Rework				8%	defect rate					6.5%	defect rate		
13		Rework-hours	2.5	rework-hours per defective unit	12,000[a]	defective units	30,000	$ 40	2.5	rework-hours per defective unit	13,000[b]	defective units	32,500	$ 40
14														
15	[a]8% defect rate × 150,000 units = 12,000 defective units													
16	[b]6.5% defect rate × 200,000 units = 13,000 defective units													

Astel's managers will compare actual costs and target costs to gain insight about improvements that can be made in subsequent target-costing efforts.

Unless managed properly, value engineering and target costing can have undesirable effects:

- Employees may feel frustrated if they fail to attain targets.
- The cross-functional team may add too many features just to accommodate the different wishes of team members.
- A product may be in development for a long time as alternative designs are evaluated repeatedly.
- Organizational conflicts may develop as the burden of cutting costs falls unequally on different business functions in the company's value chain, for example, more on manufacturing than on marketing.

Exhibit 12-5 Target Manufacturing Costs of Provalue II for 2012

Home | Insert | Page Layout | Formulas | Data | Review | View

	A	B	C	D	E	F
1		PROVALUE II				PROVALUE
2		Budgeted		Budgeted		Actual Manufacturing
3		Manufacturing Costs		Manufacturing		Cost per Unit
4		for 200,000 Units		Cost per Unit		(Exhibit 12-1)
5		(1)		(2) = (1) ÷ 200,000		(3)
6	Direct manufacturing costs					
7	Direct material costs					
8	(200,000 kits × $385 per kit)	$ 77,000,000		$385.00		$460.00
9	Direct manufacturing labor costs					
10	(530,000 DML-hours × $20 per hour)	10,600,000		53.00		64.00
11	Direct machining costs					
12	(300,000 machine-hours × $38 per machine-hour)	11,400,000		57.00		76.00
13	Direct manufacturing costs	99,000,000		495.00		600.00
14	Manufacturing overhead costs					
15	Ordering and receiving costs					
16	(21,250 orders × $80 per order)	1,700,000		8.50		12.00
17	Testing and inspection costs					
18	(3,000,000 testing-hours × $2 per hour)	6,000,000		30.00		60.00
19	Rework costs					
20	(32,500 rework-hours × $40 per hour)	1,300,000		6.50		8.00
21	Manufacturing overhead costs	9,000,000		45.00		80.00
22	Total manufaturing costs	$108,000,000		$540.00		$680.00

To avoid these pitfalls, target-costing efforts should always (a) encourage employee participation and celebrate small improvements toward achieving the target, (b) focus on the customer, (c) pay attention to schedules, and (d) set cost-cutting targets for all value-chain functions to encourage a culture of teamwork and cooperation.

Decision Point

Why is it important to distinguish cost incurrence from locked-in costs?

Cost-Plus Pricing

Learning Objective 6

Price products using the cost-plus approach

. . . cost-plus pricing is based on some measure of cost plus a markup

Instead of using the market-based approach for long-run pricing decisions, managers sometimes use a cost-based approach. The general formula for setting a cost-based price adds a markup component to the cost base to determine a prospective selling price. Because a markup is added, cost-based pricing is often called cost-plus pricing, with the plus referring to the markup component. Managers use the cost-plus pricing formula as a starting point. The markup component is rarely a rigid number. Instead, it is flexible, depending on the behavior of customers and competitors. The markup component is ultimately determined by the market.[4]

Cost-Plus Target Rate of Return on Investment

We illustrate a cost-plus pricing formula for Provalue II assuming Astel uses a 12% markup on the full unit cost of the product when computing the selling price.

Cost base (full unit cost of Provalue II)	$720.00
Markup component of 12% (0.12 × $720)	86.40
Prospective selling price	$806.40

[4] Exceptions are pricing of electricity and natural gas in many countries, where prices are set by the government on the basis of costs plus a return on invested capital. Chapter 15 discusses the use of costs to set prices in the defense-contracting industry. In these situations, products are not subject to competitive forces and cost accounting techniques substitute for markets as the basis for setting prices.

How is the markup percentage of 12% determined? One way is to choose a markup to earn a *target rate of return on investment*. The **target rate of return on investment** is the target annual operating income divided by invested capital. Invested capital can be defined in many ways. In this chapter, we define it as total assets—that is, long-term assets plus current assets. Suppose Astel's (pretax) target rate of return on investment is 18% and Provalue II's capital investment is $96 million. The target annual operating income for Provalue II is as follows:

Invested capital	$96,000,000
Target rate of return on investment	18%
Target annual operating income (0.18 × $96,000,000)	$17,280,000
Target operating income per unit of Provalue II ($17,280,000 ÷ 200,000 units)	$ 86.40

This calculation indicates that Astel needs to earn a target operating income of $86.40 on each unit of Provalue II. The markup ($86.40) expressed as a percentage of the full unit cost of the product ($720) equals 12% ($86.40 ÷ $720).

Do not confuse the 18% target rate of return on investment with the 12% markup percentage.

- The 18% target rate of return on investment expresses Astel's expected annual operating income as a percentage of investment.
- The 12% markup expresses operating income per unit as a percentage of the full product cost per unit.

Astel uses the target rate of return on investment to calculate the markup percentage.

Alternative Cost-Plus Methods

Computing the specific amount of capital invested in a product is seldom easy because it requires difficult and arbitrary allocations of investments in equipment and buildings to individual products. The following table uses alternative cost bases (without supporting calculations) and assumed markup percentages to set prospective selling prices for Provalue II without explicitly calculating invested capital to set prices.

Cost Base	Estimated Cost per Unit (1)	Markup Percentage (2)	Markup Component (3) = (1) × (2)	Prospective Selling Price (4) = (1) + (3)
Variable manufacturing cost	$475.00	65%	$308.75	$783.75
Variable cost of the product	547.00	45	246.15	793.15
Manufacturing cost	540.00	50	270.00	810.00
Full cost of the product	720.00	12	86.40	806.40

The different cost bases and markup percentages give four prospective selling prices that are close to each other. In practice, a company chooses a reliable cost base and markup percentage to recover its costs and earn a target return on investment. For example, consulting companies often choose the full cost of a client engagement as their cost base because it is difficult to distinguish variable costs from fixed costs.

The markup percentages in the preceding table vary a great deal, from a high of 65% on variable manufacturing cost to a low of 12% on full cost of the product. Why the wide variation? When determining a prospective selling price, a cost base such as variable manufacturing cost (that includes fewer costs) requires a higher markup percentage because the price needs to be set to earn a profit margin *and* to recover costs that have been excluded from the base.

Surveys indicate that most managers use the full cost of the product for cost-based pricing decisions—that is, they include both fixed and variable costs when calculating the cost per unit. Managers include fixed cost per unit in the cost base for several reasons:

1. **Full recovery of all costs of the product.** In the long run, the price of a product must exceed the full cost of the product if a company is to remain in business. Using just the variable cost as a base may tempt managers to cut prices as long as prices are

above variable cost and generate a positive contribution margin. As the experience in the airline industry has shown, variable cost pricing may cause companies to lose money because revenues are too low to recover the full cost of the product.

2. **Price stability.** Managers believe that using the full cost of the product as the basis for pricing decisions promotes price stability, because it limits the ability and temptations of salespersons to cut prices. Stable prices facilitate more-accurate forecasting and planning.
3. **Simplicity.** A full-cost formula for pricing does not require a detailed analysis of cost-behavior patterns to separate product costs into fixed and variable components. Variable and fixed cost components are difficult to identify for many costs such as testing, inspection, and setups.

Including fixed cost per unit in the cost base for pricing is not without problems. Allocating fixed costs to products can be arbitrary. Also, calculating fixed cost per unit requires a denominator level that is based on an estimate of capacity or expected units of future sales. Errors in these estimates will cause actual full cost per unit of the product to differ from the estimated amount.

Cost-Plus Pricing and Target Pricing

The selling prices computed under cost-plus pricing are *prospective* prices. Suppose Astel's initial product design results in a $750 full cost for Provalue II. Assuming a 12% markup, Astel sets a prospective price of $840 [$750 + (0.12 × $750)]. In the competitive personal computer market, customer and competitor reactions to this price may force Astel to reduce the markup percentage and lower the price to, say, $800. Astel may then want to redesign Provalue II to reduce the full cost to $720 per unit, as in our example, and achieve a markup close to 12% while keeping the price at $800. The eventual design and cost-plus price must trade-off cost, markup, and customer reactions.

The target-pricing approach reduces the need to go back and forth among prospective cost-plus prices, customer reactions, and design modifications. In contrast to cost-plus pricing, target pricing first determines product characteristics and target price on the basis of customer preferences and expected competitor responses, and then computes a target cost.

Suppliers who provide unique products and services, such as accountants and management consultants, usually use cost-plus pricing. Professional service firms set prices based on hourly cost-plus billing rates of partners, managers, and associates. These prices are, however, lowered in competitive situations. Professional service firms also take a multiple-year client perspective when deciding prices. Certified public accountants, for example, sometimes charge a client a low price initially and a higher price later.

Service companies such as home repair services, automobile repair services, and architectural firms use a cost-plus pricing method called the *time-and-materials method*. Individual jobs are priced based on materials and labor time. The price charged for materials equals the cost of materials plus a markup. The price charged for labor represents the cost of labor plus a markup. That is, the price charged for each direct cost item includes its own markup. The markups are chosen to recover overhead costs and to earn a profit.

Decision Point

How do companies price products using the cost-plus approach?

Life-Cycle Product Budgeting and Costing

Learning Objective 7

Use life-cycle budgeting and costing when making pricing decisions

. . . accumulate all costs of a product from initial R&D to final customer service for each year of the product's life

Companies sometimes need to consider target prices and target costs over a multiple-year product life cycle. The **product life cycle** spans the time from initial R&D on a product to when customer service and support is no longer offered for that product. For automobile companies such as DaimlerChrysler, Ford, and Nissan, the product life cycle is 12 to 15 years to design, introduce, and sell different car models. For pharmaceutical products, the life cycle at companies such as Pfizer, Merck, and Glaxo Smith Kline may be 15 to 20 years. For banks such as Wachovia and Chase Manhattan Bank, a product such as a newly designed savings account with specific privileges can have a life cycle of 10 to 20 years. Personal computers have a shorter life-cycle of 3 to 5 years, because rapid

innovations in the computing power and speed of microprocessors that run the computers make older models obsolete.

In **life-cycle budgeting**, managers estimate the revenues and business function costs across the entire value chain from a product's initial R&D to its final customer service and support. **Life-cycle costing** tracks and accumulates business function costs across the entire value chain from a product's initial R&D to its final customer service and support. Life-cycle budgeting and life-cycle costing span several years.

Life-Cycle Budgeting and Pricing Decisions

Budgeted life-cycle costs provide useful information for strategically evaluating pricing decisions. Consider Insight, Inc., a computer software company, which is developing a new accounting package, "General Ledger." Assume the following budgeted amounts for General Ledger over a six-year product life cycle:

Years 1 and 2

	Total Fixed Costs
R&D costs	$240,000
Design costs	160,000

Years 3 to 6

	Total Fixed Costs	Variable Cost per Package
Production costs	$100,000	$25
Marketing costs	70,000	24
Distribution costs	50,000	16
Customer-service costs	80,000	30

Exhibit 12-6 presents the six-year life-cycle budget for General Ledger for three alternative selling-price/sales-quantity combinations.

Several features make life-cycle budgeting particularly important:

1. **The development period for R&D and design is long and costly.** When a high percentage of total life-cycle costs are incurred before any production begins and any revenues are received, as in the General Ledger example, the company needs to evaluate revenues and costs over the life-cycle of the product in order to decide whether to begin the costly R&D and design activities.
2. **Many costs are locked in at R&D and design stages, even if R&D and design costs themselves are small.** In our General Ledger example, a poorly designed accounting software package, which is difficult to install and use, would result in higher marketing, distribution, and customer-service costs in several subsequent years. These costs would be even higher if the product failed to meet promised quality-performance levels. A life-cycle revenue-and-cost budget prevents Insight's managers from overlooking these multiple-year relationships among business-function costs. Life-cycle budgeting highlights costs throughout the product's life cycle and, in doing so, facilitates target pricing, target costing, and value engineering at the design stage before costs are locked in. The amounts presented in Exhibit 12-6 are the outcome of value engineering.

Insight decides to sell the General Ledger package for $480 per package because this price maximizes life-cycle operating income. Insight's managers compare actual costs to life-cycle budgets to obtain feedback and to learn about how to estimate costs better for subsequent products. Exhibit 12-6 assumes that the selling price per package is the same over the entire life cycle. For strategic reasons, however, Insight may decide to skim the market by charging higher prices to eager customers when General Ledger is first introduced and then lowering prices later as the product matures. In these later stages, Insight may even add new features to differentiate the product to maintain prices and sales. The life-cycle budget must then incorporate the revenues and costs of these strategies.

Exhibit 12-6 Budgeting Life-Cycle Revenues and Costs for "General Ledger" Software Package of Insight, Inc.[a]

	Alternative Selling-Price/ Sales-Quantity Combinations		
	A	B	C
Selling price per package	$400	$480	$600
Sales quantity in units	5,000	4,000	2,500
Life-cycle revenues ($400 × 5,000; $480 × 4,000; $600 × 2,500)	$2,000,000	$1,920,000	$1,500,000
Life-cycle costs			
R&D costs	240,000	240,000	240,000
Design costs of product/process	160,000	160,000	160,000
Production costs ($100,000 + ($25 × 5,000); $100,000 + ($25 × 4,000); $100,000 + ($25 × 2,500)	225,000	200,000	162,500
Marketing costs ($70,000 + ($24 × 5,000); $70,000 + ($24 × 4,000); $70,000 + ($24 × 2,500)	190,000	166,000	130,000
Distribution costs ($50,000 + ($16 × 5,000); $50,000 + ($16 × 4,000); $50,000 + ($16 × 2,500)	130,000	114,000	90,000
Customer-service costs ($80,000 + ($30 × 5,000); $80,000 + ($30 × 4,000); $80,000 + ($30 × 2,500)	230,000	200,000	155,000
Total life-cycle costs	1,175,000	1,080,000	937,500
Life-cycle operating income	$ 825,000	$ 840,000	$ 562,500

[a]This exhibit does not take into consideration the time value of money when computing life-cycle revenues or life-cycle costs. Chapter 21 outlines how this important factor can be incorporated into such calculations.

Management of environmental costs provides another example of life-cycle costing and value engineering. Environmental laws like the U.S. Clean Air Act and the U.S. Superfund Amendment and Reauthorization Act have introduced tougher environmental standards, imposed stringent cleanup requirements, and introduced severe penalties for polluting the air and contaminating subsurface soil and groundwater. Environmental costs that are incurred over several years of the product's life-cycle are often locked in at the product- and process-design stage. To avoid environmental liabilities, companies in industries such as oil refining, chemical processing, and automobiles practice value engineering; they design products and processes to prevent and reduce pollution over the product's life cycle. For example, laptop computer manufacturers like Hewlett Packard and Apple have introduced costly recycling programs to ensure that chemicals from nickel-cadmium batteries do not leak hazardous chemicals into the soil.

Customer Life-Cycle Costing

A different notion of life-cycle costs is *customer life-cycle costs*. **Customer life-cycle costs** focus on the total costs incurred by a customer to acquire, use, maintain, and dispose of a product or service. Customer life-cycle costs influence the prices a company can charge for its products. For example, Ford can charge a higher price and/or gain market share if its cars require minimal maintenance for 100,000 miles. Similarly, Maytag charges higher prices for appliances that save electricity and have low maintenance costs. Boeing Corporation justifies a higher price for the Boeing 777 because the plane's design allows mechanics easier access to different areas of the plane to perform routine maintenance, reduces the time and cost of maintenance, and significantly decreases the life-cycle cost of owning the plane.

Decision Point

Describe life-cycle budgeting and life-cycle costing and when companies should use these techniques.

Additional Considerations for Pricing Decisions

Learning Objective 8

Describe two pricing practices in which noncost factors are important when setting prices

. . . price discrimination—charging different customers different prices for the same product—and peak-load pricing—charging higher prices when demand approaches capacity limits

In some cases, cost is *not* a major factor in setting prices. We explore some of the ways that market structures and laws and regulations influence price setting outside of cost.

Price Discrimination

Consider the prices airlines charge for a round-trip flight from Boston to San Francisco. A coach-class ticket for a flight with seven-day advance purchase is $450 if the passenger stays in San Francisco over a Saturday night. It is $1,000 if the passenger returns without staying over a Saturday night. Can this price difference be explained by the difference in the cost to the airline of these round-trip flights? No; it costs the same amount to transport the passenger from Boston to San Francisco and back, regardless of whether the passenger stays in San Francisco over a Saturday night. This difference in price is due to *price discrimination*.

Price discrimination is the practice of charging different customers different prices for the same product or service. How does price discrimination work in the airline example? The demand for airline tickets comes from two main sources: business travelers and pleasure travelers. Business travelers must travel to conduct business for their organizations, so their demand for air travel is relatively insensitive to price. Airlines can earn higher operating incomes by charging business travelers higher prices. Insensitivity of demand to price changes is called *demand inelasticity*. Also, business travelers generally go to their destinations, complete their work, and return home without staying over a Saturday night. Pleasure travelers, in contrast, usually don't need to return home during the week, and prefer to spend weekends at their destinations. Because they pay for their tickets themselves, pleasure travelers' demand is price-elastic, lowering prices stimulates demand. Airlines can earn higher operating incomes by charging pleasure travelers lower prices.

How can airlines keep fares high for business travelers while, at the same time, keeping fares low for pleasure travelers? Requiring a Saturday night stay discriminates between the two customer segments. The airlines price-discriminate to take advantage of different sensitivities to prices exhibited by business travelers and pleasure travelers. Prices differ even though there is no difference in cost in serving the two customer segments.

What if economic conditions weaken such that business travelers become more sensitive to price? The airlines may then need to lower the prices they charge to business travelers. Following the events of September 11, 2001, airlines started offering discounted fares on certain routes without requiring a Saturday night stay to stimulate business travel. Business travel picked up and airlines started filling more seats than they otherwise would have. Unfortunately, travel did not pick up enough, and the airline industry as a whole suffered severe losses over the next few years.

Peak-Load Pricing

Decision Point

Describe price discrimination and peak-load pricing.

In addition to price discrimination, other noncost factors such as capacity constraints affect pricing decisions. **Peak-load pricing** is the practice of charging a higher price for the same product or service when the demand for the product or service approaches the physical limit of the capacity to produce that product or service. When demand is high and production capacity is limited, customers are willing to pay more to get the product or service. In contrast, slack or excess capacity leads companies to lower prices in order to stimulate demand and utilize capacity. Peak-load pricing occurs in the telephone, telecommunications, hotel, car rental, and electric-utility industries. During the 2008 Summer Olympics in Beijing, for example, hotels charged very high rates and required multiple-night stays. Airlines charged high fares for flights into and out of many cities in the region for roughly a month around the time of the games. Demand far exceeded capacity and the hospitality industry and airlines employed peak-load pricing to increase their profits.

International Considerations

Another example of factors other than costs affecting prices occurs when the same product is sold in different countries. Consider software, books, and medicines produced in one country and sold globally. The prices charged in each country vary much more than the costs of delivering the product to each country. These price differences arise because of differences in the purchasing power of consumers in different countries (a form of price discrimination) and government restrictions that may limit the prices that can be charged.

Antitrust Laws

Legal considerations also affect pricing decisions. Companies are not always free to charge whatever price they like. For example, under the U.S. Robinson-Patman Act, a manufacturer cannot price-discriminate between two customers if the intent is to lessen or prevent competition for customers. Two key features of price-discrimination laws are as follows:

1. Price discrimination is permissible if differences in prices can be justified by differences in costs.
2. Price discrimination is illegal only if the intent is to lessen or prevent competition.

The price discrimination by airline companies described earlier is legal because their practices do not hinder competition.

Learning Objective 9

Explain the effects of antitrust laws on pricing

. . . antitrust laws attempt to counteract pricing below costs to drive out competitors or fixing prices artificially high to harm consumers

Predatory Pricing

To comply with U.S. antitrust laws, such as the Sherman Act, the Clayton Act, the Federal Trade Commission Act, and the Robinson-Patman Act, pricing must not be predatory.[5] A company engages in **predatory pricing** when it deliberately prices below its costs in an effort to drive competitors out of the market and restrict supply, and then raises prices rather than enlarge demand.[6]

The U.S. Supreme Court established the following conditions to prove that predatory pricing has occurred:

- The predator company charges a price below an appropriate measure of its costs.
- The predator company has a reasonable prospect of recovering in the future, through larger market share or higher prices, the money it lost by pricing below cost.

The Supreme Court has not specified the "appropriate measure of costs."[7]

Most courts in the United States have defined the "appropriate measure of costs" as the short-run marginal or average variable costs.[8] In *Adjustor's Replace-a-Car* v. *Agency Rent-a-Car,* Adjustor's (the plaintiff) claimed that it was forced to withdraw from the Austin and San Antonio, Texas, markets because Agency had engaged in predatory pricing.[9] To prove predatory pricing, Adjustor pointed to "the net loss from operations" in Agency's income statement, calculated after allocating Agency's headquarters overhead. The judge, however, ruled that Agency had not engaged in predatory

---

[5] Discussion of the Sherman Act and the Clayton Act is in A. Barkman and J. Jolley, "Cost Defenses for Antitrust Cases," *Management Accounting* 67 (no. 10): 37–40.

[6] For more details, see W. Viscusi, J. Harrington, and J. Vernon, *Economics of Regulation and Antitrust*, 4th ed. (Cambridge, MA: MIT Press, 2006); and J. L. Goldstein, "Single Firm Predatory Pricing in Antitrust Law: The Rose Acre Recoupment Test and the Search for an Appropriate Judicial Standard," *Columbia Law Review* 91 (1991): 1557–1592.

[7] *Brooke Group* v. *Brown & Williamson Tobacco*, 113 S. Ct. (1993); T. J. Trujillo, "Predatory Pricing Standards Under Recent Supreme Court Decisions and Their Failure to Recognize Strategic Behavior as a Barrier to Entry," *Iowa Journal of Corporation Law* (Summer 1994): 809–831.

[8] An exception is *McGahee* v. *Northern Propane Gas Co.* [858 F, 2d 1487 (1988)], in which the Eleventh Circuit Court held that prices below average total cost constitute evidence of predatory intent. For more discussion, see P. Areeda and D. Turner, "Predatory Pricing and Related Practices under Section 2 of Sherman Act," *Harvard Law Review* 88 (1975): 697–733. For an overview of case law, see W. Viscusi, J. Harrington, and J. Vernon, *Economics of Regulation and Antitrust*, 4th ed. (Cambridge, MA: MIT Press, 2006). See also the "Legal Developments" section of the *Journal of Marketing* for summaries of court cases.

[9] *Adjustor's Replace-a-Car, Inc.* v. *Agency Rent-a-Car*, 735 2d 884 (1984).

pricing because the price it charged for a rental car never dropped below its average variable costs.

The Supreme Court decision in *Brooke Group* v. *Brown & Williamson Tobacco* (*BWT*) increased the difficulty of proving predatory pricing. The Court ruled that pricing below average variable costs is not predatory if the company does not have a reasonable chance of later increasing prices or market share to recover its losses.[10] The defendant, BWT, a cigarette manufacturer, sold brand-name cigarettes and had 12% of the cigarette market. The introduction of generic cigarettes threatened BWT's market share. BWT responded by introducing its own version of generics priced below average variable cost, thereby making it difficult for generic manufacturers to continue in business. The Supreme Court ruled that BWT's action was a competitive response and not predatory pricing. That's because, given BWT's small 12% market share and the existing competition within the industry, it would be unable to later charge a monopoly price to recoup its losses.

Dumping

Closely related to predatory pricing is dumping. Under U.S. laws, **dumping** occurs when a non-U.S. company sells a product in the United States at a price below the market value in the country where it is produced, and this lower price materially injures or threatens to materially injure an industry in the United States. If dumping is proven, an antidumping duty can be imposed under U.S. tariff laws equal to the amount by which the foreign price exceeds the U.S. price. Cases related to dumping have occurred in the cement, computer, lumber, paper, semiconductor, steel, sweater, and tire industries. In September 2009, the U.S. Commerce Department said it would place import duties of 25%–35% on imports of automobile and light-truck tires from China.[11] China challenged the decision to the dispute settlement panel of the World Trade Organization (WTO), an international institution created with the goal of promoting and regulating trade practices among countries.

Collusive Pricing

Decision Point

How do antitrust laws affect pricing?

Another violation of antitrust laws is collusive pricing. **Collusive pricing** occurs when companies in an industry conspire in their pricing and production decisions to achieve a price above the competitive price and so restrain trade. In 2008, for example, LG agreed to pay $400 million and Sharp $120 million for colluding to fix prices of LCD picture tubes in the United States.

[10] *Brooke Group* v. *Brown & Williamson Tobacco*, 113 S. Ct. (1993).
[11] Edmund Andrews, "U.S. Adds Tariffs on Chinese Tires," *New York Times* (September 11, 2009).

Problem for Self-Study

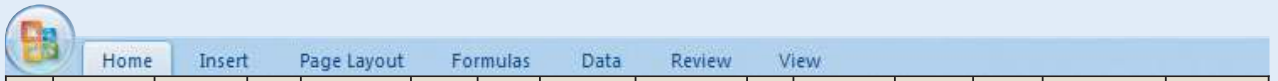
Reconsider the Astel Computer example (pp. 436–437). Astel's marketing manager realizes that a further reduction in price is necessary to sell 200,000 units of Provalue II. To maintain a target profitability of $16 million, or $80 per unit, Astel will need to reduce costs of Provalue II by $6 million, or $30 per unit. Astel targets a reduction of $4 million, or $20 per unit, in manufacturing costs, and $2 million, or $10 per unit, in marketing, distribution, and customer-service costs. The cross-functional team assigned to this task proposes the following changes to manufacture a different version of Provalue, called Provalue III:

1. Reduce direct materials and ordering costs by purchasing subassembled components rather than individual components.
2. Reengineer ordering and receiving to reduce ordering and receiving costs per order.

3. Reduce testing time and the labor and power required per hour of testing.
4. Develop new rework procedures to reduce rework costs per hour.

No changes are proposed in direct manufacturing labor cost per unit and in total machining costs.

The following table summarizes the cost-driver quantities and the cost per unit of each cost driver for Provalue III compared with Provalue II.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1			Manufacturing Cost Information						Manufacturing Cost Information					
2			for 200,000 Units of Provalue II for 2012						for 200,000 Units of Provalue III for 2012					
3	Cost Category	Cost Driver	Details of Budgeted Cost Driver Quantities				Budgeted Total Quantity of Cost Driver	Budgeted Cost per Unit of Cost Driver	Details of Budgeted Cost Driver Quantities				Budgeted Total Quantity of Cost Driver	Budgeted Cost per Unit of Cost Driver
4	(1)	(2)	(3)		(4)		(5)=(3)×(4)	(6)	(7)		(8)		(9)=(7)×(8)	(10)
5	Direct materials	No. of kits	1	kit per unit	200,000	units	200,000	$385	1	kit per unit	200,000	units	200,000	$375
6	Direct manuf. labor (DML)	DML hours	2.65	DML hours per unit	200,000	units	530,000	$ 20	2.65	DML hours per unit	200,000	units	530,000	$ 20
7	Direct machining (fixed)	Machine-hours					300,000	$ 38					300,000	$ 38
8	Ordering and receiving	No. of orders	50	orders per component	425	compo-nents	21,250	$ 80	50	orders per component	400	compo-nents	20,000	$ 60
9	Test and inspection	Testing-hours	15	testing-hours per unit	200,000	units	3,000,000	$ 2	14	testing-hours per unit	200,000	units	2,800,000	$ 1.70
10	Rework				6.5%	defect rate					6.5%	defect rate		
11		Rework-hours	2.5	rework-hours per defective unit	13,000[a]	defec-tive units	32,500	$ 40	2.5	rework-hours per defective unit	13,000[a]	defec-tive units	32,500	$ 32
12														
13	[a]6.5% defect rate × 200,000 units = 13,000 defective units													

Will the proposed changes achieve Astel's targeted reduction of $4 million, or $20 per unit, in manufacturing costs for Provalue III? Show your computations. **Required**

Solution

Exhibit 12-7 presents the manufacturing costs for Provalue III based on the proposed changes. Manufacturing costs will decline from $108 million, or $540 per unit (Exhibit 12-5), to $104 million, or $520 per unit (Exhibit 12-7), and will achieve the target reduction of $4 million, or $20 per unit.

Exhibit 12-7 Target Manufacturing Costs of Provalue III for 2012 Based on Proposed Changes

Home Insert Page Layout Formulas Data Review View

	A	B	C	D
1		**Budgeted**		**Budgeted**
2		**Manufacturing Costs**		**Manufacturing**
3		**for 200,000 Units**		**Cost per Unit**
4		**(1)**		**(2) = (1) ÷ 200,000**
5	Direct manufacturing costs			
6	Direct material costs			
7	(200,000 kits × $375 per kit)	$ 75,000,000		$375.00
8	Direct manufacturing labor costs			
9	(530,000 DML-hours × $20 per hour)	10,600,000		53.00
10	Direct machining costs			
11	(300,000 machine-hours × $38 per machine-hour)	11,400,000		57.00
12	Direct manufacturing costs	97,000,000		485.00
13				
14	Manufacturing overhead costs			
15	Ordering and receiving costs			
16	(20,000 orders × $60 per order)	1,200,000		6.00
17	Testing and inspection costs			
18	(2,800,000 testing-hours × $1.70 per hour)	4,760,000		23.80
19	Rework costs			
20	(32,500 rework-hours × $32 per hour)	1,040,000		5.20
21	Manufacturing overhead costs	7,000,000		35.00
22	Total manufacturing costs	$104,000,000		$520.00

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 answers to that question.

Decision	Guidelines
1. What are the three major influences on pricing decisions?	Customers, competitors, and costs influence prices through their effects on demand and supply; customers and competitors affect demand, and costs affect supply.
2. What do companies consider when making short-run pricing decisions?	When making short-run pricing decisions companies only consider those (relevant) costs that will change in total as a result of the decision. Pricing is done opportunistically based on demand and competition.
3. How do companies make long-run pricing decisions?	Companies consider all future variable and fixed costs as relevant and use a market-based or a cost-based pricing approach to earn a target return on investment.
4. How do companies determine target costs?	One approach to long-run pricing is to use a target price. Target price is the estimated price that potential customers are willing to pay for a product or service. Target operating income per unit is subtracted from the target price to determine target cost per unit. Target cost per unit is the estimated long-run cost of a product or service that when sold enables the company to achieve target operating income per unit. The challenge for the company is to make the cost improvements necessary through value-engineering methods to achieve the target cost.

5. Why is it important to distinguish cost incurrence from locked-in costs?

Cost incurrence describes when a resource is sacrificed. Locked-in costs are costs that have not yet been incurred but, based on decisions that have already been made, will be incurred in the future. To reduce costs, techniques such as value engineering are most effective *before* costs are locked in.

6. How do companies price products using the cost-plus approach?

The cost-plus approach to pricing adds a markup component to a cost base as the starting point for pricing decisions. Many different costs, such as full cost of the product or manufacturing cost, can serve as the cost base in applying the cost-plus formula. Prices are then modified on the basis of customers' reactions and competitors' responses. Therefore, the size of the "plus" is determined by the marketplace.

7. Describe life-cycle budgeting and life-cycle costing and when companies should use these techniques.

Life-cycle budgeting estimates and life-cycle costing tracks and accumulates the costs (and revenues) attributable to a product from its initial R&D to its final customer service and support. These life-cycle techniques are particularly important when (a) a high percentage of total life-cycle costs are incurred before production begins and revenues are earned over several years, and (b) a high fraction of the life-cycle costs are locked in at the R&D and design stages.

8. Describe price discrimination and peak-load pricing.

Price discrimination is charging some customers a higher price for a given product or service than other customers. Peak-load pricing is charging a higher price for the same product or service when demand approaches physical-capacity limits. Under price discrimination and peak-load pricing, prices differ among market segments and across time periods even though the cost of providing the product or service is approximately the same.

9. How do antitrust laws affect pricing?

To comply with antitrust laws, a company must not engage in predatory pricing, dumping, or collusive pricing, which lessens competition; puts another company at an unfair competitive disadvantage; or harms consumers.

Terms to Learn

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

collusive pricing (**p. 452**)
cost incurrence (**p. 442**)
customer life-cycle costs (**p. 449**)
designed-in costs (**p. 442**)
dumping (**p. 452**)
life-cycle budgeting (**p. 448**)
life-cycle costing (**p. 448**)
locked-in costs (**p. 442**)
nonvalue-added cost (**p. 442**)
peak-load pricing (**p. 450**)
predatory pricing (**p. 451**)
price discrimination (**p. 450**)
product life cycle (**p. 447**)
target cost per unit (**p. 440**)
target operating income per unit (**p. 440**)
target price (**p. 439**)
target rate of return on investment (**p. 446**)
value-added cost (**p. 442**)
value engineering (**p. 441**)

Assignment Material

Questions

MyAccountingLab

12-1 What are the three major influences on pricing decisions?
12-2 "Relevant costs for pricing decisions are full costs of the product." Do you agree? Explain.
12-3 Give two examples of pricing decisions with a short-run focus.
12-4 How is activity-based costing useful for pricing decisions?
12-5 Describe two alternative approaches to long-run pricing decisions.
12-6 What is a target cost per unit?
12-7 Describe value engineering and its role in target costing.
12-8 Give two examples of a value-added cost and two examples of a nonvalue-added cost.
12-9 "It is not important for a company to distinguish between cost incurrence and locked-in costs." Do you agree? Explain.

12-10 What is cost-plus pricing?

12-11 Describe three alternative cost-plus pricing methods.

12-12 Give two examples in which the difference in the costs of two products or services is much smaller than the difference in their prices.

12-13 What is life-cycle budgeting?

12-14 What are three benefits of using a product life-cycle reporting format?

12-15 Define predatory pricing, dumping, and collusive pricing.

MyAccountingLab

Exercises

12-16 Relevant-cost approach to pricing decisions, special order. The following financial data apply to the DVD production plant of the Dill Company for October 2011:

	Budgeted Manufacturing Cost per DVD Pack
Direct materials	$1.60
Direct manufacturing labor	0.90
Variable manufacturing overhead	0.70
Fixed manufacturing overhead	1.00
Total manufacturing cost	$4.20

Variable manufacturing overhead varies with the number of DVD packs produced. Fixed manufacturing overhead of $1 per pack is based on budgeted fixed manufacturing overhead of $150,000 per month and budgeted production of 150,000 packs per month. The Dill Company sells each pack for $5.

Marketing costs have two components:

- Variable marketing costs (sales commissions) of 5% of revenues
- Fixed monthly costs of $65,000

During October 2011, Lyn Randell, a Dill Company salesperson, asked the president for permission to sell 1,000 packs at $4.00 per pack to a customer not in Dill's normal marketing channels. The president refused this special order because the selling price was below the total budgeted manufacturing cost.

Required

1. What would have been the effect on monthly operating income of accepting the special order?
2. Comment on the president's "below manufacturing costs" reasoning for rejecting the special order.
3. What other factors should the president consider before accepting or rejecting the special order?

12-17 Relevant-cost approach to short-run pricing decisions. The San Carlos Company is an electronics business with eight product lines. Income data for one of the products (XT-107) for June 2011 are as follows:

Revenues, 200,000 units at average price of $100 each		$20,000,000
Variable costs		
Direct materials at $35 per unit	$7,000,000	
Direct manufacturing labor at $10 per unit	2,000,000	
Variable manufacturing overhead at $6 per unit	1,200,000	
Sales commissions at 15% of revenues	3,000,000	
Other variable costs at $5 per unit	1,000,000	
Total variable costs		14,200,000
Contribution margin		5,800,000
Fixed costs		5,000,000
Operating income		$ 800,000

Abrams, Inc., an instruments company, has a problem with its preferred supplier of XT-107. This supplier has had a three-week labor strike. Abrams approaches the San Carlos sales representative, Sarah Holtz, about providing 3,000 units of XT-107 at a price of $75 per unit. Holtz informs the XT-107 product manager, Jim McMahon, that she would accept a flat commission of $8,000 rather than the usual 15% of revenues if this special order were accepted. San Carlos has the capacity to produce 300,000 units of XT-107 each month, but demand has not exceeded 200,000 units in any month in the past year.

Required

1. If the 3,000-unit order from Abrams is accepted, how much will operating income increase or decrease? (Assume the same cost structure as in June 2011.)

2. McMahon ponders whether to accept the 3,000-unit special order. He is afraid of the precedent that might be set by cutting the price. He says, "The price is below our full cost of $96 per unit. I think we should quote a full price, or Abrams will expect favored treatment again and again if we continue to do business with it." Do you agree with McMahon? Explain.

12-18 Short-run pricing, capacity constraints. Colorado Mountains Dairy, maker of specialty cheeses, produces a soft cheese from the milk of Holstein cows raised on a special corn-based diet. One kilogram of soft cheese, which has a contribution margin of $10, requires 4 liters of milk. A well-known gourmet restaurant has asked Colorado Mountains to produce 2,600 kilograms of a hard cheese from the same milk of Holstein cows. Knowing that the dairy has sufficient unused capacity, Elise Princiotti, owner of Colorado Mountains, calculates the costs of making one kilogram of the desired hard cheese:

Milk (8 liters × $2.00 per liter)	$16
Variable direct manufacturing labor	5
Variable manufacturing overhead	4
Fixed manufacturing cost allocated	6
Total manufacturing cost	$31

Required

1. Suppose Colorado Mountains can acquire all the Holstein milk that it needs. What is the minimum price per kilogram it should charge for the hard cheese?
2. Now suppose that the Holstein milk is in short supply. Every kilogram of hard cheese produced by Colorado Mountains will reduce the quantity of soft cheese that it can make and sell. What is the minimum price per kilogram it should charge to produce the hard cheese?

12-19 Value-added, nonvalue-added costs. The Marino Repair Shop repairs and services machine tools. A summary of its costs (by activity) for 2011 is as follows:

a.	Materials and labor for servicing machine tools	$800,000
b.	Rework costs	75,000
c.	Expediting costs caused by work delays	60,000
d.	Materials-handling costs	50,000
e.	Materials-procurement and inspection costs	35,000
f.	Preventive maintenance of equipment	15,000
g.	Breakdown maintenance of equipment	55,000

Required

1. Classify each cost as value-added, nonvalue-added, or in the gray area between.
2. For any cost classified in the gray area, assume 65% is value-added and 35% is nonvalue-added. How much of the total of all seven costs is value-added and how much is nonvalue-added?
3. Marino is considering the following changes: (a) introducing quality-improvement programs whose net effect will be to reduce rework and expediting costs by 75% and materials and labor costs for servicing machine tools by 5%; (b) working with suppliers to reduce materials-procurement and inspection costs by 20% and materials-handling costs by 25%; and (c) increasing preventive-maintenance costs by 50% to reduce breakdown-maintenance costs by 40%. Calculate the effect of programs (a), (b), and (c) on value-added costs, nonvalue-added costs, and total costs. Comment briefly.

12-20 Target operating income, value-added costs, service company. Calvert Associates prepares architectural drawings to conform to local structural-safety codes. Its income statement for 2012 is as follows:

Revenues	$701,250
Salaries of professional staff (7,500 hours × $52 per hour)	390,000
Travel	15,000
Administrative and support costs	171,600
Total costs	576,600
Operating income	$124,650

Following is the percentage of time spent by professional staff on various activities:

Making calculations and preparing drawings for clients	77%
Checking calculations and drawings	3
Correcting errors found in drawings (not billed to clients)	8
Making changes in response to client requests (billed to clients)	5
Correcting own errors regarding building codes (not billed to clients)	7
Total	100%

Assume administrative and support costs vary with professional-labor costs.

Consider each requirement independently.

Required

1. How much of the total costs in 2012 are value-added, nonvalue-added, or in the gray area between? Explain your answers briefly. What actions can Calvert take to reduce its costs?
2. Suppose Calvert could eliminate all errors so that it did not need to spend any time making corrections and, as a result, could proportionately reduce professional-labor costs. Calculate Calvert's operating income for 2012.
3. Now suppose Calvert could take on as much business as it could complete, but it could not add more professional staff. Assume Calvert could eliminate all errors so that it does not need to spend any time correcting errors. Assume Calvert could use the time saved to increase revenues proportionately. Assume travel costs will remain at $15,000. Calculate Calvert's operating income for 2012.

12-21 Target prices, target costs, activity-based costing. Snappy Tiles is a small distributor of marble tiles. Snappy identifies its three major activities and cost pools as ordering, receiving and storage, and shipping, and it reports the following details for 2011:

Activity	Cost Driver	Quantity of Cost Driver	Cost per Unit of Cost Driver
1. Placing and paying for orders of marble tiles	Number of orders	500	$50 per order
2. Receiving and storage	Loads moved	4,000	$30 per load
3. Shipping of marble tiles to retailers	Number of shipments	1,500	$40 per shipment

For 2011, Snappy buys 250,000 marble tiles at an average cost of $3 per tile and sells them to retailers at an average price of $4 per tile. Assume Snappy has no fixed costs and no inventories.

Required

1. Calculate Snappy's operating income for 2011.
2. For 2012, retailers are demanding a 5% discount off the 2011 price. Snappy's suppliers are only willing to give a 4% discount. Snappy expects to sell the same quantity of marble tiles in 2012 as in 2011. If all other costs and cost-driver information remain the same, calculate Snappy's operating income for 2012.
3. Suppose further that Snappy decides to make changes in its ordering and receiving-and-storing practices. By placing long-run orders with its key suppliers, Snappy expects to reduce the number of orders to 200 and the cost per order to $25 per order. By redesigning the layout of the warehouse and reconfiguring the crates in which the marble tiles are moved, Snappy expects to reduce the number of loads moved to 3,125 and the cost per load moved to $28. Will Snappy achieve its target operating income of $0.30 per tile in 2012? Show your calculations.

12-22 Target costs, effect of product-design changes on product costs. Medical Instruments uses a manufacturing costing system with one direct-cost category (direct materials) and three indirect-cost categories:

a. Setup, production order, and materials-handling costs that vary with the number of batches
b. Manufacturing-operations costs that vary with machine-hours
c. Costs of engineering changes that vary with the number of engineering changes made

In response to competitive pressures at the end of 2010, Medical Instruments used value-engineering techniques to reduce manufacturing costs. Actual information for 2010 and 2011 is as follows:

	2010	2011
Setup, production-order, and materials-handling costs per batch	$ 8,000	$ 7,500
Total manufacturing-operations cost per machine-hour	$ 55	$ 50
Cost per engineering change	$12,000	$10,000

The management of Medical Instruments wants to evaluate whether value engineering has succeeded in reducing the target manufacturing cost per unit of one of its products, HJ6, by 10%.

Actual results for 2010 and 2011 for HJ6 are as follows:

	Actual Results for 2010	Actual Results for 2011
Units of HJ6 produced	3,500	4,000
Direct material cost per unit of HJ6	$ 1,200	$ 1,100
Total number of batches required to produce HJ6	70	80
Total machine-hours required to produce HJ6	21,000	22,000
Number of engineering changes made	14	10

Required

1. Calculate the manufacturing cost per unit of HJ6 in 2010.
2. Calculate the manufacturing cost per unit of HJ6 in 2011.

3. Did Medical Instruments achieve the target manufacturing cost per unit for HJ6 in 2011? Explain.
4. Explain how Medical Instruments reduced the manufacturing cost per unit of HJ6 in 2011.

12-23 Cost-plus target return on investment pricing. John Blodgett is the managing partner of a business that has just finished building a 60-room motel. Blodgett anticipates that he will rent these rooms for 15,000 nights next year (or 15,000 room-nights). All rooms are similar and will rent for the same price. Blodgett estimates the following operating costs for next year:

Variable operating costs	$5 per room-night
Fixed costs	
Salaries and wages	$173,000
Maintenance of building and pool	52,000
Other operating and administration costs	150,000
Total fixed costs	$375,000

The capital invested in the motel is $900,000. The partnership's target return on investment is 25%. Blodgett expects demand for rooms to be uniform throughout the year. He plans to price the rooms at full cost plus a markup on full cost to earn the target return on investment.

Required

1. What price should Blodgett charge for a room-night? What is the markup as a percentage of the full cost of a room-night?
2. Blodgett's market research indicates that if the price of a room-night determined in requirement 1 is reduced by 10%, the expected number of room-nights Blodgett could rent would increase by 10%. Should Blodgett reduce prices by 10%? Show your calculations.

12-24 Cost-plus, target pricing, working backward. Road Warrior manufactures and sells a model of motorcycle, XR500. In 2011, it reported the following:

Units produced and sold	1,500
Investment	$8,400,000
Markup percentage on full cost	9%
Rate of return on investment	18%
Variable cost per unit	$8,450

Required

1. What was Road Warrior's operating income on XR500 in 2011? What was the full cost per unit? What was the selling price? What was the percentage markup on variable cost?
2. Road Warrior is considering increasing the annual spending on advertising for the XR500 by $500,000. The company believes that the investment will translate into a 10% increase in unit sales. Should the investment be made? Show your calculations.
3. Refer back to the original data. In 2012, Road Warrior believes that it will only be able to sell 1,400 units at the price calculated in requirement 1. Management has identified $125,000 in fixed cost that can be eliminated. If Road Warrior wants to maintain a 9% markup on full cost, what is the target variable cost per unit?

12-25 Life cycle product costing. Gadzooks, Inc., develops and manufactures toys that it then sells through infomercials. Currently, the company is designing a toy robot that it intends to begin manufacturing and marketing next year. Because of the rapidly changing nature of the toy industry, Gadzooks management projects that the robot will be produced and sold for only three years. At the end of the product's life cycle, Gadzooks plans to sell the rights to the robot to an overseas company for $250,000. Cost information concerning the robot follows:

		Total Fixed Costs over Four Years	Variable Cost per Unit
Year 1	Design costs	$ 650,000	—
Years 2–4	Production costs	$3,560,000	$20 per unit
	Marketing and distribution costs	$2,225,000	$5 per unit

For simplicity, ignore the time value of money.

Required

1. Suppose the managers at Gadzooks price the robot at $50 per unit. How many units do they need to sell to break even?
2. The managers at Gadzooks are thinking of two alternative pricing strategies.
   a. Sell the robot at $50 each from the outset. At this price they expect to sell 500,000 units over its life-cycle.
   b. Boost the selling price of the robot in year 2 when it first comes out to $70 per unit. At this price they expect to sell 100,000 units in year 2. In years 3 and 4 drop the price to $40 per unit. The managers expect to sell 300,000 units each year in years 3 and 4. Which pricing strategy would you recommend? Explain.

MyAccountingLab

Problems

12-26 Relevant-cost approach to pricing decisions. Burst, Inc., cans peaches for sale to food distributors. All costs are classified as either manufacturing or marketing. Burst prepares monthly budgets. The March 2012 budgeted absorption-costing income statement is as follows:

Revenues (1,000 crates × $117 a crate)	$117,000
Cost of goods sold	65,000
Gross margin	52,000
Marketing costs	30,000
Operating income	$ 22,000

Gross margin markup percentage: $52,000 ÷ $65,000 = 80% of cost of goods sold (full manufacturing cost)

Monthly costs are classified as fixed or variable (with respect to the number of crates produced for manufacturing costs and with respect to the number of crates sold for marketing costs):

	Fixed	Variable
Manufacturing	$30,000	$35,000
Marketing	13,000	17,000

Burst has the capacity to can 2,000 crates per month. The relevant range in which monthly fixed manufacturing costs will be "fixed" is from 500 to 2,000 crates per month.

Required

1. Calculate the markup percentage based on total variable costs.
2. Assume that a new customer approaches Burst to buy 200 crates at $55 per crate for cash. The customer does not require any marketing effort. Additional manufacturing costs of $3,000 (for special packaging) will be required. Burst believes that this is a one-time-only special order because the customer is discontinuing business in six weeks' time. Burst is reluctant to accept this 200-crate special order because the $55-per-crate price is below the $65-per-crate full manufacturing cost. Do you agree with this reasoning? Explain.
3. Assume that the new customer decides to remain in business. How would this longevity affect your willingness to accept the $55-per-crate offer? Explain.

12-27 Considerations other than cost in pricing decisions. Executive Suites operates a 100-suite hotel in a busy business park. During April, a 30-day month, Executive Suites experienced a 90% occupancy rate from Monday evening through Thursday evening (weeknights), with business travelers making up virtually all of its guests. On Friday through Sunday evenings (weekend nights), however, occupancy dwindled to 20%. Guests on these nights were all leisure travelers. (There were 18 weeknights and 12 weekend nights in April.) Executive Suites charges $68 per night for a suite. Fran Jackson has recently been hired to manage the hotel, and is trying to devise a way to increase the hotel's profitability. The following information relates to Executive Suites' costs:

	Fixed Cost	Variable Cost
Depreciation	$20,000 per month	
Administrative costs	$35,000 per month	
Housekeeping and supplies	$12,000 per month	$25 per room night
Breakfast	$ 5,000 per month	$5 per breakfast served

Executive Suites offers free breakfast to guests. In April, there were an average of 1.0 breakfasts served per room night on weeknights and 2.5 breakfasts served per room night on weekend nights.

Required

1. Calculate the average cost per guest night for April. What was Executive Suites' operating income or loss for the month?
2. Fran Jackson estimates that if Executive Suites increases the nightly rates to $80, weeknight occupancy will only decline to 85%. She also estimates that if the hotel reduces the nightly rate on weekend nights to $50, occupancy on those nights will increase to 50%. Would this be a good move for Executive Suites? Show your calculations.
3. Why would the $30 price difference per night be tolerated by the weeknight guests?
4. A discount travel clearing-house has approached Executive Suites with a proposal to offer last-minute deals on empty rooms on both weeknights and weekend nights. Assuming that there will be an average of two breakfasts served per night per room, what is the minimum price that Executive Suites could accept on the last-minute rooms?

12-28 Cost-plus, target pricing, working backward. The new CEO of Radco Manufacturing has asked for a variety of information about the operations of the firm from last year. The CEO is given the following information, but with some data missing:

Total sales revenue	?
Number of units produced and sold	500,000 units
Selling price	?
Operating income	$195,000
Total investment in assets	$2,000,000
Variable cost per unit	$3.75
Fixed costs for the year	$3,000,000

Required

1. Find (a) total sales revenue, (b) selling price, (c) rate of return on investment, and (d) markup percentage on full cost for this product.
2. The new CEO has a plan to reduce fixed costs by $200,000 and variable costs by $0.60 per unit while continuing to produce and sell 500,000 units. Using the same markup percentage as in requirement 1, calculate the new selling price.
3. Assume the CEO institutes the changes in requirement 2 including the new selling price. However, the reduction in variable cost has resulted in lower product quality resulting in 10% fewer units being sold compared to before the change. Calculate operating income (loss).

12-29 Target prices, target costs, value engineering, cost incurrence, locked-in costs, activity-based costing. Cutler Electronics makes an MP3 player, CE100, which has 80 components. Cutler sells 7,000 units each month for $70 each. The costs of manufacturing CE100 are $45 per unit, or $315,000 per month. Monthly manufacturing costs are as follows:

Direct material costs	$182,000
Direct manufacturing labor costs	28,000
Machining costs (fixed)	31,500
Testing costs	35,000
Rework costs	14,000
Ordering costs	3,360
Engineering costs (fixed)	21,140
Total manufacturing costs	$315,000

Cutler's management identifies the activity cost pools, the cost driver for each activity, and the cost per unit of the cost driver for each overhead cost pool as follows:

Manufacturing Activity	Description of Activity	Cost Driver	Cost per Unit of Cost Driver
1. Machining costs	Machining components	Machine-hour capacity	$4.50 per machine-hour
2. Testing costs	Testing components and final product (Each unit of CE100 is tested individually.)	Testing-hours	$2 per testing-hour
3. Rework costs	Correcting and fixing errors and defects	Units of CE100 reworked	$20 per unit
4. Ordering costs	Ordering of components	Number of orders	$21 per order
5. Engineering costs	Designing and managing of products and processes	Engineering-hour capacity	$35 per engineering-hour

Cutler's management views direct material costs and direct manufacturing labor costs as variable with respect to the units of CE100 manufactured. Over a long-run horizon, each of the overhead costs described in the preceding table varies, as described, with the chosen cost drivers.

The following additional information describes the existing design:

a. Testing time per unit is 2.5 hours.
b. 10% of the CE100s manufactured are reworked.
c. Cutler places two orders with each component supplier each month. Each component is supplied by a different supplier.
d. It currently takes one hour to manufacture each unit of CE100.

In response to competitive pressures, Cutler must reduce its price to $62 per unit and its costs by $8 per unit. No additional sales are anticipated at this lower price. However, Cutler stands to lose significant sales if it does not reduce its price. Manufacturing has been asked to reduce its costs by $6 per unit. Improvements in manufacturing efficiency are expected to yield a net savings of $1.50 per MP3 player, but that is not enough. The chief engineer has proposed a new modular design that reduces the number of components to 50 and also simplifies testing. The newly designed MP3 player, called "New CE100" will replace CE100.

The expected effects of the new design are as follows:

a. Direct material cost for the New CE100 is expected to be lower by $2.20 per unit.
b. Direct manufacturing labor cost for the New CE100 is expected to be lower by $0.50 per unit.
c. Machining time required to manufacture the New CE100 is expected to be 20% less, but machine-hour capacity will not be reduced.
d. Time required for testing the New CE100 is expected to be lower by 20%.
e. Rework is expected to decline to 4% of New CE100s manufactured.
f. Engineering-hours capacity will remain the same.

Assume that the cost per unit of each cost driver for CE100 continues to apply to New CE100.

Required

1. Calculate Cutler's manufacturing cost per unit of New CE100.
2. Will the new design achieve the per-unit cost-reduction targets that have been set for the manufacturing costs of New CE100? Show your calculations.
3. The problem describes two strategies to reduce costs: (a) improving manufacturing efficiency and (b) modifying product design. Which strategy has more impact on Cutler's costs? Why? Explain briefly.

12-30 Cost-plus, target return on investment pricing. Vend-o-licious makes candy bars for vending machines and sells them to vendors in cases of 30 bars. Although Vend-o-licious makes a variety of candy, the cost differences are insignificant, and the cases all sell for the same price.

Vend-o-licious has a total capital investment of $13,000,000. It expects to produce and sell 500,000 cases of candy next year. Vend-o-licious requires a 10% target return on investment.

Expected costs for next year are as follows:

Variable production costs	$3.50 per case
Variable marketing and distribution costs	$1.50 per case
Fixed production costs	$1,000,000
Fixed marketing and distribution costs	$700,000
Other fixed costs	$500,000

Vend-o-licious prices the cases of candy at full cost plus markup to generate profits equal to the target return on capital.

Required

1. What is the target operating income?
2. What is the selling price Vend-o-licious needs to charge to earn the target operating income? Calculate the markup percentage on full cost.
3. Vend-o-licious's closest competitor has just increased its candy case price to $15, although it sells 36 candy bars per case. Vend-o-licious is considering increasing its selling price to $14 per case. Assuming production and sales decrease by 5%, calculate Vend-o-licious' return on investment. Is increasing the selling price a good idea?

12-31 Cost-plus, time and materials, ethics. R & C Mechanical sells and services plumbing, heating, and air conditioning systems. R & C's cost accounting system tracks two cost categories: direct labor and direct materials. R & C uses a time-and-materials pricing system, with direct labor marked up 100% and direct materials marked up 60% to recover indirect costs of support staff, support materials, and shared equipment and tools, and to earn a profit.

R & C technician Greg Garrison is called to the home of Ashley Briggs on a particularly hot summer day to investigate her broken central air conditioning system. He considers two options: replace the compressor or repair it. The cost information available to Garrison follows:

	Labor	Materials
Repair option	5 hrs.	$100
Replace option	2 hrs.	$200
Labor rate	$30 per hour	

Required

1. If Garrison presents Briggs with the replace or repair options, what price would he quote for each?
2. If the two options were equally effective for the three years that Briggs intends to live in the home, which option would she choose?
3. If Garrison's objective is to maximize profits, which option would he recommend to Briggs? What would be the ethical course of action?

12-32 Cost-plus and market-based pricing. Florida Temps, a large labor contractor, supplies contract labor to building-construction companies. For 2012, Florida Temps has budgeted to supply 84,000 hours of contract labor. Its variable costs are $13 per hour, and its fixed costs are $168,000. Roger Mason, the general manager, has proposed a cost-plus approach for pricing labor at full cost plus 20%.

Required

1. Calculate the price per hour that Florida Temps should charge based on Mason's proposal.
2. The marketing manager supplies the following information on demand levels at different prices:

Price per Hour	Demand (Hours)
$16	124,000
17	104,000
18	84,000
19	74,000
20	61,000

   Florida Temps can meet any of these demand levels. Fixed costs will remain unchanged for all the demand levels. On the basis of this additional information, calculate the price per hour that Florida Temps should charge to maximize operating income.
3. Comment on your answers to requirements 1 and 2. Why are they the same or different?

12-33 Cost-plus and market-based pricing. (CMA, adapted) Best Test Laboratories evaluates the reaction of materials to extreme increases in temperature. Much of the company's early growth was attributable to government contracts, but recent growth has come from expansion into commercial markets. Two types of testing at Best Test are Heat Testing (HTT) and Arctic-condition Testing (ACT). Currently, all of the budgeted operating costs are collected in a single overhead pool. All of the estimated testing-hours are also collected in a single pool. One rate per test-hour is used for both types of testing. This hourly rate is marked up by 45% to recover administrative costs and taxes, and to earn a profit.

Rick Shaw, Best Test's controller, believes that there is enough variation in the test procedures and cost structure to establish separate costing rates and billing rates at a 45% mark up. He also believes that the inflexible rate structure currently being used is inadequate in today's competitive environment. After analyzing the company data, he has divided operating costs into the following three cost pools:

Labor and supervision	$ 491,840
Setup and facility costs	402,620
Utilities	368,000
Total budgeted costs for the period	$1,262,460

Rick Shaw budgets 106,000 total test-hours for the coming period. This is also the cost driver for labor and supervision. The budgeted quantity of cost driver for setup and facility costs is 800 setup hours. The budgeted quantity of cost driver for utilities is 10,000 machine-hours.

Rick has estimated that HTT uses 60% of the testing hours, 25% of the setup hours, and half the machine-hours.

Required

1. Find the single rate for operating costs based on test-hours and the hourly billing rate for HTT and ACT.
2. Find the three activity-based rates for operating costs.
3. What will the billing rate for HTT and ACT be based on the activity-based costing structure? State the rates in terms of testing hours. Referring to both requirements 1 and 2, which rates make more sense for Best Test?
4. If Best Test's competition all charge $20 per hour for arctic testing, what can Best Test do to stay competitive?

12-34 Life-cycle costing. New Life Metal Recycling and Salvage has just been given the opportunity to salvage scrap metal and other materials from an old industrial site. The current owners of the site will sign over the site to New Life at no cost. New Life intends to extract scrap metal at the site for 24 months, and then will clean up the site, return the land to useable condition, and sell it to a developer. Projected costs associated with the project follow:

		Fixed	Variable
Months 1–24	Metal extraction and processing	$4,000 per month	$100 per ton
Months 1–27	Rent on temporary buildings	$2,000 per month	—
	Administration	$5,000 per month	—
Months 25–27	Clean-up	$30,000 per month	—
	Land restoration	$475,000 total	—
	Cost of selling land	$150,000 total	—

Ignore time value of money.

Required

1. Assuming that New Life expects to salvage 50,000 tons of metal from the site, what is the total project life cycle cost?
2. Suppose New Life can sell the metal for $150 per ton and wants to earn a profit (before taxes) of $40 per ton. At what price must New Life sell the land at the end of the project to achieve its target profit per ton?
3. Now suppose New Life can only sell the metal for $140 per ton and the land at $100,000 less than what you calculated in requirement 2. If New Life wanted to maintain the same mark-up percentage on total project life-cycle cost as in requirement 2, by how much would it have to reduce its total project life-cycle cost?

12-35 Airline pricing, considerations other than cost in pricing. Air Eagle is about to introduce a daily round-trip flight from New York to Los Angeles and is determining how it should price its round-trip tickets.

The market research group at Air Eagle segments the market into business and pleasure travelers. It provides the following information on the effects of two different prices on the number of seats expected to be sold and the variable cost per ticket, including the commission paid to travel agents:

		Number of Seats Expected to Be Sold	
Price Charged	**Variable Cost per Ticket**	**Business**	**Pleasure**
$ 500	$ 65	200	100
2,100	175	180	20

Pleasure travelers start their travel during one week, spend at least one weekend at their destination, and return the following week or thereafter. Business travelers usually start and complete their travel within the same work week. They do not stay over weekends.

Assume that round-trip fuel costs are fixed costs of $24,000 and that fixed costs allocated to the round-trip flight for airplane-lease costs, ground services, and flight-crew salaries total $188,000.

Required

1. If you could charge different prices to business travelers and pleasure travelers, would you? Show your computations.
2. Explain the key factor (or factors) for your answer in requirement 1.
3. How might Air Eagle implement price discrimination? That is, what plan could the airline formulate so that business travelers and pleasure travelers each pay the price desired by the airline?

12-36 Ethics and pricing. Apex Art has been requested to prepare a bid on 500 pieces of framed artwork for a new hotel. Winning the bid would be a big boost for sales representative Jason Grant, who works entirely on commission. Sonja Gomes, the cost accountant for Apex, prepares the bid based on the following cost information:

Direct costs		
Artwork		$30,000
Framing materials		40,000
Direct manufacturing labor		20,000
Delivery and installation		7,500
Overhead costs		
Production order	2,000	
Setup	4,000	
Materials handling	5,500	
General and administration	12,000	
Total overhead costs		23,500
Full product costs		$121,000

Based on the company policy of pricing at 125% of full cost, Gomes gives Grant a figure of $151,250 to submit for the job. Grant is very concerned. He tells Gomes that at that price, Apex has no chance of winning the job. He confides in her that he spent $500 of company funds to take the hotel's purchasing agent to a basketball playoff game where the purchasing agent disclosed that a bid of $145,000 would win the job. He hadn't planned to tell Gomes because he was confident that the bid she developed would be below that amount. Gomes reasons that the $500 he spent will be wasted if Apex doesn't capitalize on this valuable information. In any case, the company will still make money if it wins the bid at $145,000 because it is higher than the full cost of $121,000.

Required

1. Is the $500 spent on the basketball tickets relevant to the bid decision? Why or why not?
2. Gomes suggests that if Grant is willing to use cheaper materials for the frame, he can achieve a bid of $145,000. The artwork has already been selected and cannot be changed, so the entire amount of reduction in cost will need to come from framing materials. What is the target cost of framing materials that will allow Grant to submit a bid of $145 assuming a target markup of 25% of full cost?
3. Evaluate whether Gomes' suggestion to Grant to use the purchasing agent's tip is unethical. Would it be unethical for Grant to redo the project's design to arrive at a lower bid? What steps should Grant and Gomes take to resolve this situation?

Collaborative Learning Problem

12-37 Value engineering, target pricing, and locked-in costs. Pacific Décor, Inc., designs, manufactures, and sells contemporary wood furniture. Ling Li is a furniture designer for Pacific. Li has spent much of the past month working on the design of a high-end dining room table. The design has been well-received by Jose Alvarez, the product development manager. However, Alvarez wants to make sure that the table can be priced competitively. Amy Hoover, Pacific's cost accountant, presents Alvarez with the following cost data for the expected production of 200 tables:

Design cost	$ 5,000
Direct materials	120,000
Direct manufacturing labor	142,000
Variable manufacturing overhead	64,000
Fixed manufacturing overhead	46,500
Marketing	15,000

Required

1. Alvarez thinks that Pacific can successfully market the table for $2,000. The company's target operating income is 10% of revenue. Calculate the target full cost of producing the 200 tables. Does the cost estimate developed by Hoover meet Pacific's requirements? Is value engineering needed?
2. Alvarez discovers that Li has designed the table two inches wider than the standard size of wood normally used by Pacific. Reducing the table's size by two inches will lower the cost of direct materials by 40%. However, the redesign will require an additional $6,000 of design cost, and the table will be sold for $1,950. Will this design change allow the table to meet its target cost? Are the costs of materials a locked-in cost?
3. Li insists that the two inches are an absolute necessity in terms of the table's design. She believes that spending an additional $7,000 on better marketing will allow Pacific to sell the tables for $2,200. If this is the case, will the table's target cost be achieved without any value engineering?
4. Compare the total operating income on the 200 tables for requirements 2 and 3. What do you recommend Pacific do, based solely on your calculations? Explain briefly.