# Chapter 11

# STRATEGIC COST MANAGEMENT

## Learning Objectives

**After completing this chapter, you should be able to**

- Understand the impact of cost management on the supply chain
- Understand the fundamental approaches to price management
- Understand approaches for reducing supplier costs of production and delivery
- Understand the concept of total cost of ownership
- Identify collaborative approaches to cost management

## Chapter Outline


A Structured Approach to Cost Reduction

Price Analysis
- Market Structure
- Economic Conditions
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## *Southwest Shrugs Off Oil Prices*

The surge in oil prices in 2007 has impacted many industries, not least of which is the airline industry. Fuel costs make up a significant portion of airline operating costs. One airline, Southwest, has used this fact to its advantage in the current high-fuel-cost environment. Although Southwest has for many years dominated the industry because of better service and happier and more productive workers, the reason for Southwest's rapidly increasing advantage in recent years is that it simply loaded up years ago on hedges against higher fuel prices. With oil trading above $90 a barrel, most of the rest of the airline industry is facing a huge run-up in costs. Southwest, however, owns long-term contracts to buy most of its fuel through 2009 for what it would cost if oil were $51 a barrel. The value of these hedges soared as oil raced above $90 a barrel, and they are now worth more than $2 billion. These gains will be mostly realized over the next two years. Other airlines passed on buying all but the shortest-term insurance against high fuel prices, such that they could start reporting losses as early as 2008, unless they are able to rapidly raise fares. At American Airlines, annual fuel costs rise $80 million for every dollar increase in a barrel of oil, said their CFO, Thomas Horton.

In January 2007, other airlines were enjoying the prospect of Southwest's misery as oil dipped down to about $52 a barrel. Southwest's hedges cap most of its fuel needs at about $51 a barrel, so they were of little use at that point. Southwest also has the highest labor rates in the industry, because they have not demanded deep wage concessions from workers. Southwest's hedges used during the first nine months of 2007, which included options that allowed—but did not require—it to buy energy products at certain prices, cost $42 million. This is a small sum in retrospect, but was not so easily spent when higher oil prices were only a possibility. Now, the other airlines are kicking themselves for not having hedged fuel costs. "We all wish we were Southwest," said Tim Walker, a JetBlue officer who manages its fuel contracts. "Southwest was just gorgeous with what they did years ago. They put their foot down." To compensate, other airlines have had six industry fare increases in the third quarter, whereas Southwest's average ticket price was only 62 cents higher than a year earlier. The question for Southwest is whether it can turn yet another huge temporary advantage into a long-term edge. Its revenue-raising ideas are relatively modest, but it faces labor negotiations with its main worker groups, none of whom want to make concessions. Gary Kelly, the chief executive, noted that "this cycle could and should be another one of those times we can prevail." Southwest generally expects high fuel prices to prevail, and if it sees what it thinks is a short-term decline in oil prices, the carrier would consider adding to its hedges for years beyond 2009. In hindsight, executives at Southwest feel that they should have picked up even more when prices were lower.

**HEDGED, PRICE CAP (PER BARREL)**

| | 2007 4TH QUARTER | 2008 | 2009 | 2010 |
|---|---|---|---|---|
| Alaska | 50%, $72 | 32%, $64 | 5%, $68 | 0 |
| American | 40%, $69 | 14%, n.a. | 0 | 0 |
| Continental | 30%, $93 | 10%, $93 | 0 | 0 |
| Delta | 20%, $99 | 0 | 0 | 0 |
| JetBlue | 47%, $83 | 0 | 0 | 0 |
| Northwest | 50%, $73 | 10%, $84 | 0 | 0 |
| Southwest | 90%, $51 | 70%, $51 | 55%, $51 | 25%, $63 |
| United | 18%, $93 | 0 | 0 | 0 |
| US Airways | 56%, $73 | 15%, $73 | 0 | 0 |

The table on p. 383 shows the percentage of each airline's fuel needs that is hedged against higher fuel prices.

Source: J. Bailey, "An Airline Shrugs at Oil Prices," *New York Times,* November 29, 2007, p. C1.

In today's economy, the driving force behind global competition can be summarized in a single equation:

$$\text{Value} = (\text{Quality} + \text{Technology} + \text{Service} + \text{Cycle Time})/\text{Price}$$

Although purchasing has a major impact on all of the variables in the numerator in this equation, this chapter focuses on the denominator: price, and its primary driver, cost. A major responsibility of purchasing is to ensure that the price paid for an item is fair and reasonable. The price paid for purchased products and services will have a direct impact on the end customer's perception of value provided by the organization, thereby leading to a competitive advantage in the marketplace. By delivering value through continued progress in reducing costs, and thereby improving profit margins and return on assets for enterprises, purchasing is truly becoming a force of its own within the executive boardroom.

Evaluation of a supplier's actual cost to provide the product or service, versus the actual purchase price paid, is an ongoing challenge within all industries. In many situations, the need to control costs requires a focus on the costs associated with producing an item or service, versus simply analyzing final price. In these cases, innovative pricing approaches involve cost identification as a process leading to agreement on a final price. In other cases, however, purchasing may not need to spend much effort understanding costs, and will focus instead on whether the price is fair given competitive market conditions.

Purchasing and supply chain specialists must understand the principles of price and cost analysis. **Price analysis** refers to the process of comparing supplier prices against external price benchmarks, without direct knowledge of the supplier's costs. Price analysis focuses simply on a seller's price with little or no consideration given to the actual cost of production. In contrast, **cost analysis** is the process of analyzing each individual cost element (i.e., material, labor hours and rates, overhead, general and administrative costs, and profit) that together add up to the final price. Ideally, this analysis identifies the actual cost to produce an item so the parties to a contract can determine a fair and reasonable price and develop plans to achieve future cost reductions. Finally, **total cost analysis** applies the price/cost equation across multiple processes that span two or more organizations across a supply chain. For example, the total cost of shipping a good manufactured from China into the United States may include shipping, tariffs, inventory, quality, and other costs that are over and above the actual price paid to the Chinese manufacturer.

This chapter presents a traditional discussion of price and cost fundamentals along with a number of innovative price and cost management tools that can be applied using available information on the Internet and simple spreadsheet analysis. Some of these tools are price analysis, reverse price analysis, and total cost analysis. By applying such tools, purchasers can evolve toward a system of strategic cost management that seeks to reduce costs across the entire supply chain. Although not all of these tools are appropriate for every situation, supply managers must learn to recognize when and how such tools can be applied.

## A Structured Approach to Cost Reduction

Managers are increasingly considering the implications of price and cost management from a total supply chain perspective, as shown in Exhibit 11.1. In the past, many companies focused their cost efforts on internal cost management initiatives. These included approaches such as value analysis, process improvements, standardization, improvements in efficiency by utilizing technology, and others. Although these approaches are still relevant, the impact that they have on the majority of costs is not as great as in the past. Why? With the increased amount of outsourcing occurring in every global company today, the majority of the cost of goods sold is driven by suppliers, which are outside of the four walls of an organization. In this environment, organizations wanting to fully capture the benefits of cost-reduction initiatives must implement approaches that include both upstream and downstream members of their supply chains. Such a change requires a fundamental shift in thinking in the minds of managers and employees.

This new generation of cost management initiatives requires that purchasing and logistics executives adopt a series of new initiatives that can deliver results to the bottom line. As shown in Exhibit 11.2 on p. 386, strategic cost management approaches typically involve at least two supply chain partners working together to identify process improvements that reduce costs across the supply chain. Examples include team-based value-engineering efforts, supplier development and kaizen events, cross-enterprise cost-reduction projects, joint brainstorming efforts on new products, supplier suggestion programs, and supply chain redesign efforts. These types of efforts require that both parties commit to achieving cost-reduction strategies that go beyond simple haggling over prices.

Strategic cost management approaches will vary according to the stage of the product life cycle. As shown in Exhibit 11.3 on p. 387, various approaches are appropriate at different product life cycle stages. In the initial concept and development stage, purchasing will often act proactively to establish cost targets. Target costing/target

**Exhibit 11.1** Cost Management Approaches

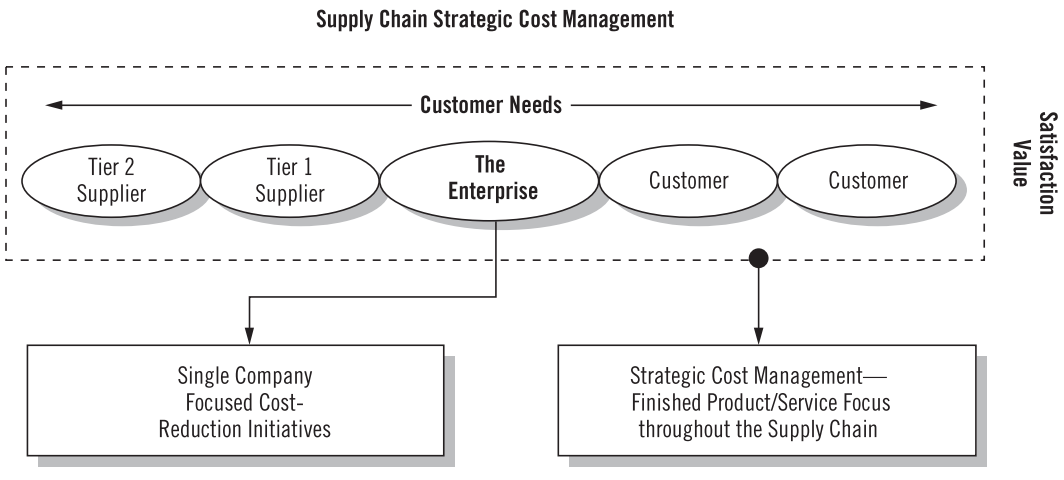
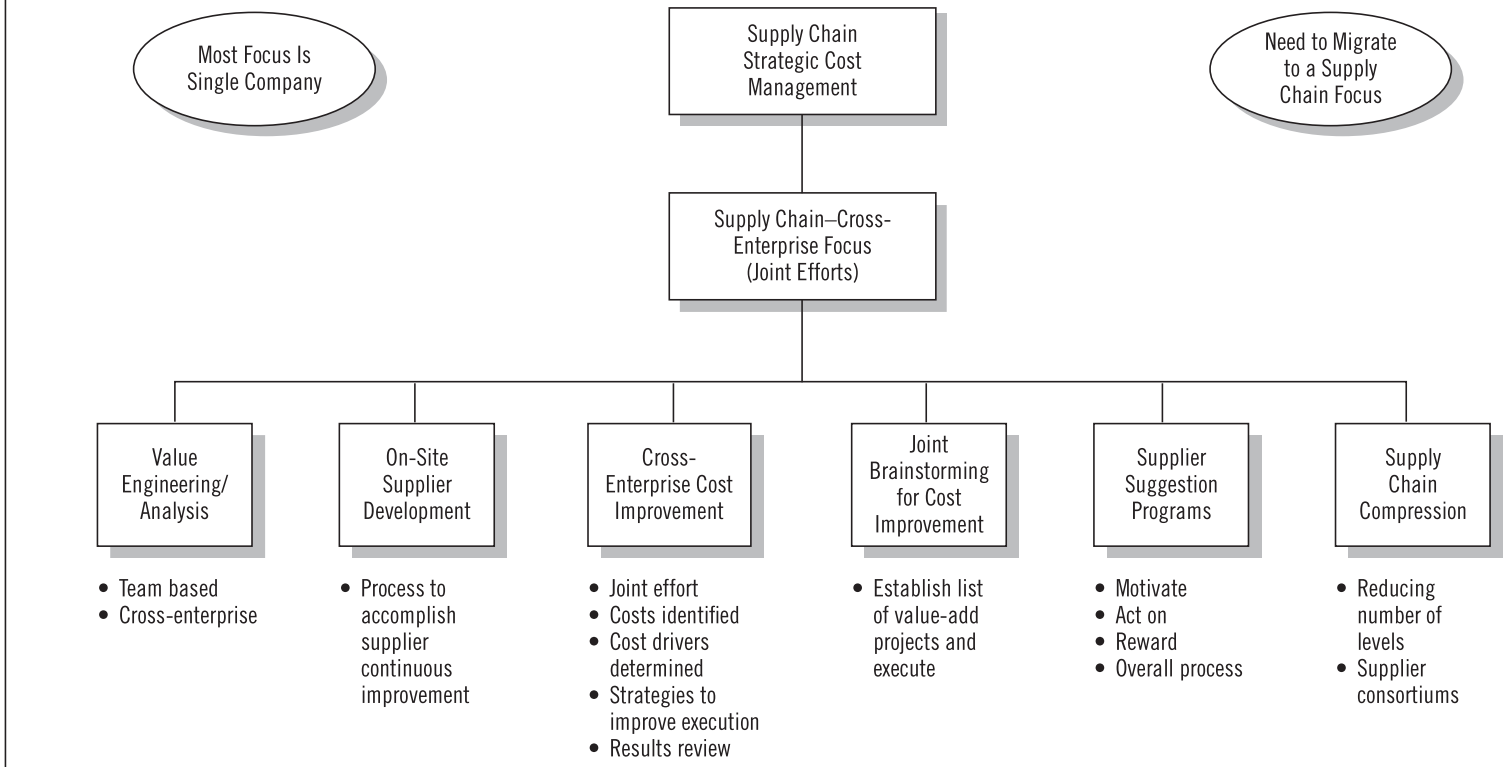


**Exhibit 11.2** Supply Chain Strategic Cost Management Processes

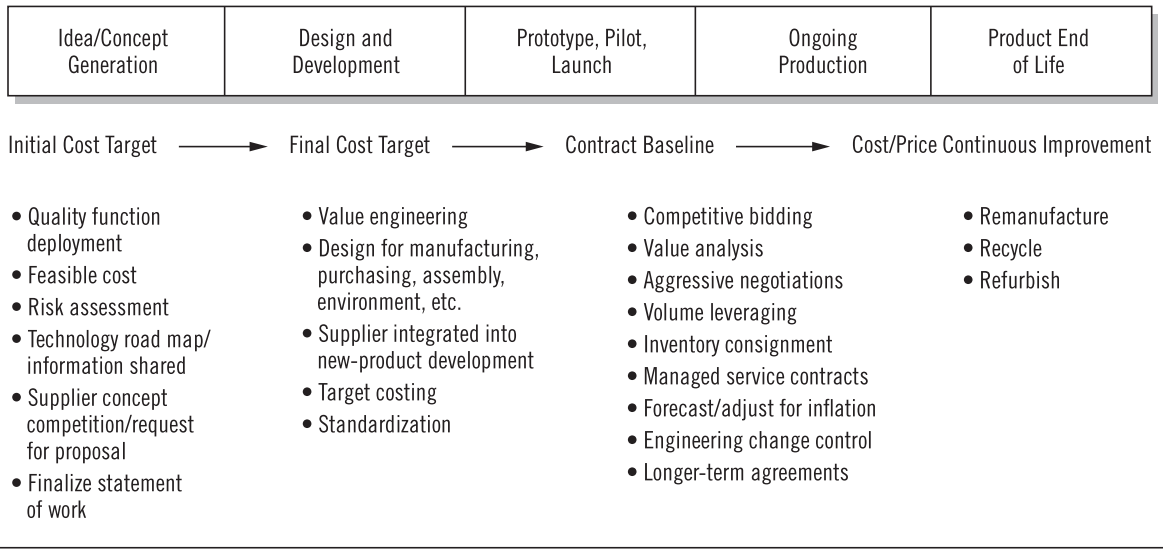


pricing is a technique developed originally in Japanese organizations in the 1980s to combat the inflation of the yen against other currencies. Target pricing, quality function deployment, and technology sharing are all effective approaches for cost reduction used at this stage.

As a product or service enters the design and launch stages, supplier integration, standardization, value engineering, and design for manufacturing can improve the opportunity to use standard parts and techniques, leverage volumes, and create opportunities for cost savings. During the product or service launch, purchasing will adopt more traditional cost-reduction approaches, including competitive bidding, negotiation, value analysis, volume leveraging, service contracts focusing on savings, and linking longer-term pricing to extended contracts. As a product reaches its end of life, purchasing cannot ignore the potential value of environmental initiatives to remanufacture, recycle, or refurbish products that are becoming obsolete. As an example of this, print cartridge manufacturers such as Xerox and Hewlett-Packard have developed innovative technologies that allow customers to recycle laser toner cartridges, which are subsequently refurbished and used again, eliminating landfill costs.

The major benefits from cost-reduction efforts occur when purchasing is involved early in the new-product/service development cycle. When sourcing decisions are made early in the product life cycle, the full effects of a sourcing decision over the product's life can be considered. When purchasing is involved later in the product development cycle, efforts to reduce costs have a minimal impact because the major decisions regarding types of materials, labor rates, and choice of suppliers have already been made. A manager in a major automotive company described this situation as follows: "In the past, we allowed engineering to determine the specifications, the materials, and the supplier. In fact, the supplier already produced the first prototype! That's when they decided to call in purchasing to develop the contract. How

**Exhibit 11.3** Managing Life Cycle Costs

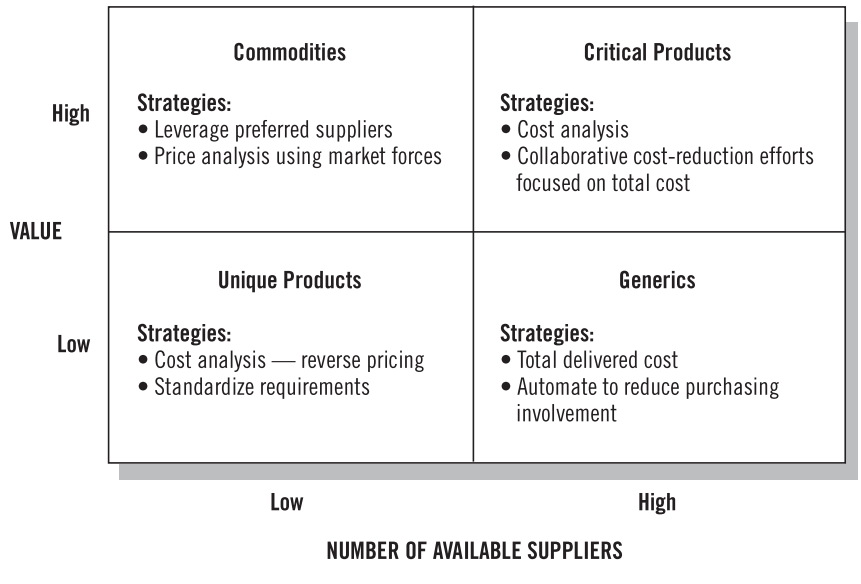


much leverage do you have in convincing the supplier to reduce costs when the supplier already knows they are guaranteed the business, and they have already sunk money into a fixed design and tooling for the product?"[1]

When prioritizing efforts to reduce costs, companies often apply a structured framework for cost reduction similar to the one illustrated in Exhibit 11.4. This framework is consistent with the portfolio analysis framework developed in Chapter 6 and should be integrated into an organization's commodity strategy development process. As shown in Exhibit 11.4, each approach requires a different strategic focus in terms of price versus cost. In general, low-value generics in which a competitive market with many potential suppliers exists should emphasize total delivered price. There is no need to spend time conducting a detailed cost analysis for low-value items that do not produce significant returns. Greater returns can be obtained by having users order these products or services directly through supplier catalogs, procurement cards, or other e-procurement technologies. Commodities are high-value products or services that also have a competitive market situation; for example, computers and technology are certainly in this category (as discussed in the opening vignette). These types of products and services can be sourced through traditional bidding approaches that require price analysis using market forces to do the work and identify what is a competitive price. With greater standardization being introduced in many industries, products once considered as critical are being moved into the commodities quadrant.

Unique products present a different challenge: Companies must strive to reduce costs for products with few available suppliers, yet that are still low value. Examples include suppliers of unique fasteners, specialty papers, and specialty MRO items. For such items, purchasers will want to identify suppliers that are charging too high a price. Further analysis of their pricing through a technique known as "reverse price analysis" (discussed later in the chapter) may identify price discrepancies that can be reduced through greater standardization of user requirements or ongoing negotiations

**Exhibit 11.4** Framework for Strategic Cost Management



## Sourcing Snapshot

## *Global Commodity Markets Shifting*

In 2007, the latest demand boom for base metals is in its third year and has elevated nonferrous metals pricing to record highs. Steel prices are reflecting iron ore, scrap, ferroalloy, and energy costs—rather than demand trends—probably for the first time.

"Pricing cycles for commodities are shrinking," says the global procurement manager at a Detroit-area auto parts company. "The steel cycle used to be 7 to 10 years in length from peak to valley in prices. Nowadays, it's more like 18 months due to the rapid change in delivery of information."

Atop all that, says Peter Connelly, CPO at diversified manufacturer Leggett & Platt, "supplier consolidation and pricing volatility is making forecasting difficult and, actually, past a 90-day window, very inaccurate." Rather than being a sign of the top for commodity prices, analysts worry that the deal-making could help put a lid on supply and put even more pressure on a host of commodity prices.

This view is supported by research director Anirvan Banerji at the Economic Cycle Research Institute in New York. Most forecasters have a dismal record of predicting the timing of cyclical turns in economic growth, jobs, and inflation, he writes, "because most people and forecasting models expect recent patterns to persist in the near future." This is "a sure recipe for being surprised on prices by the next turn in the global industrial cycle."

And then, there is nature. The late-summer hurricanes of 2005 taught energy and petrochemical buyers just how fast supply can be disrupted and prices can explode.

"It's all about energy and raw materials these days," says Dan DiMicco, CEO of Nucor Corp., the Charlotte, NC–based steelmaker. "With the volatility in and high level of materials pricing nowadays, nobody wants to carry inventory—whether it's in the raw materials at my mills or the finished products we ship to our customers."

Stating that "in a commodity market today, intelligence is king," DiMicco told a recent steel industry conference that "to run as efficiently as we can, mills and service centers will have to start at the customer—and talk to buyers about what they really need and what they expect they will be paying. Only then can we take some volatility out of the metals market—and come to some equitable long-term arrangements on price and supply."

So, the foundation for any successful commodity-forecasting program must be based on detailed market knowledge that can smooth out current volatility and help ensure against disrupted flow of raw materials, says Mike Burns, global business director for polyethylene at supply chain consultancy Resin Technology Inc. in Fort Worth, Texas.

Burns insists that buyers "emerge from their comfortable silos" and get knowledgeable about global economics, supply, demand, and sourcing alternatives—"whatever they need to know to become expert about their company, their industry, and their regional and global supply chain." Solid market facts are needed to develop effective buying plans, and that includes accurate price forecasting, says Burns.

Source: T. Stundza, "Commodities Forecasting: It's All in Your Head," *Purchasing* magazine online, May 14, 2007.

with problematic suppliers. In effect, this may mean transitioning a product or service from the unique quadrant to the generics quadrant. Many of the commodities previously thought to belong in the generics quadrant are shifting to strategic, based on global capacity and demand forecasts for 2008 onwards (see Sourcing Snapshot: Global Commodity Markets Shifting).

The major focus of a purchaser's efforts to reduce costs should be on critical products where relatively few suppliers exist but the items are higher value. Managers should commit time to exploring opportunities for value analysis/engineering, cost-savings sharing, collaborative efforts focused on identifying cost drivers, and supplier integration early in the product development cycle. Cost analysis involves breaking down a supplier's price into its cost elements to uncover potential cost savings and, hence, price reductions.

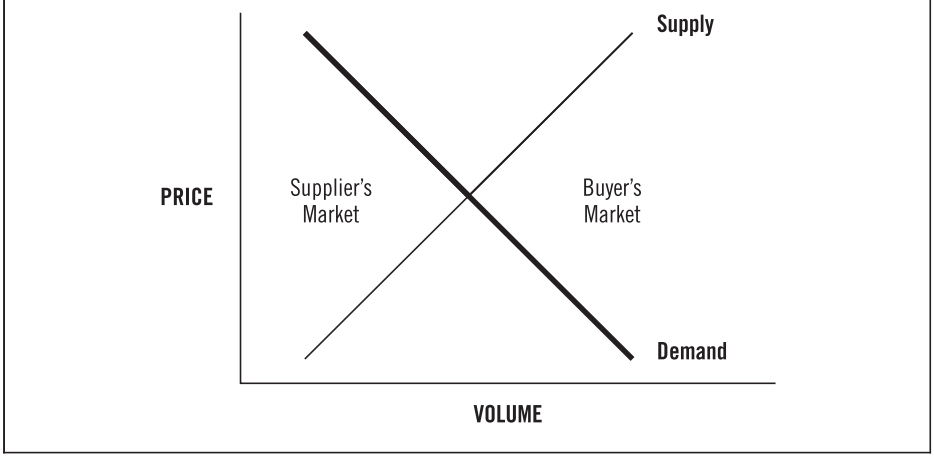
The remainder of this chapter presents a discussion of price analysis (commodities and generics quadrants), cost analysis (unique and critical quadrants), and total cost analysis (all four quadrants) that can be applied to help control the costs associated with these different purchased goods and services.

## Price Analysis

In order to understand the factors affecting pricing levels in a given market, it is crucial to employ a market analysis—an analytical tool that identifies the primary external forces that are causing prices to either increase or decrease. As shown in Exhibit 11.5, prices are driven to a large extent by the degree of competition in a market, as well as by conditions of supply and demand. The resulting market prices are indicated by a heavier line, depending on the volume of supply in a given situation.

When demand exceeds supply, a seller's market exists, and prices generally increase. The reverse situation, a buyer's market, occurs when supply exceeds demand,

**Exhibit 11.5** Market-Based Pricing



and prices generally move downward. There should be an appreciation for the variety of variables that directly and indirectly influence an item's price.

## Market Structure

Although it is clear that the supplier's market condition has a major influence on price, the factors affecting market conditions are not always easy to predict. Market environment is often driven by the number of competitors in an industry, the relative similarity (or lack thereof) of their products, and any existing barriers to entry for new competitors. At one end of the scale, there may exist a monopoly, where only one supplier can provide a given product or service. A good example of this condition exists in the pharmaceutical industry, where the company first to market with a new patented drug has exclusive rights to sell the product for seven years. (At the end of this period, generics, which copy the drug's formulation, enter the market, thereby driving down the cost of the drug.)

At the other end of the spectrum is perfect competition, in which there exist identical products with minimal barriers for new suppliers to enter the market. Price is solely a function of the forces of supply and demand. No single seller or producer controls enough of the market to affect the market price. Of course, a seller could reduce its price with the hope of selling additional products. In the long run, however, this simply results in lost revenue.

An industry with only a few large competitors is classified as oligopolistic. The market and pricing strategies of one competitor directly influence others within the industry. Examples of oligopolies in the United States historically include the steel, automobile, and appliance industries. Within an oligopolistic industry, a firm may assume the role of a price leader and raise or lower prices, which can result in all other firms changing their prices or choosing to maintain existing price levels. If others do not follow, the initiating firm might be forced to reverse the change. The growth of international trade and competition has created additional choices in many industries, shifting market power away from the producer and toward the purchaser.

## Economic Conditions

Economic conditions often determine whether a market is favorable to the seller or to the purchaser. When capacity utilization at producers is high (supply is tight) and demand for output is strong, supply and demand factors combine to create pricing conditions favorable to the seller. When this occurs, buyers often attempt to keep prices or price increases below the industry average. When an industry is in a decline, purchasers can take advantage of this to negotiate favorable supply arrangements.

The macroeconomy influences prices; for example, interest rate levels influence the internal rate of return at a supplier—the overall cost of capital, which drives productive investment. Even the level of the dollar in relation to other currencies influences price, particularly for international purchasing. Also, tight labor markets can create cost increases, resulting in higher purchase prices.

Knowledge of economic conditions is helpful when identifying the market factors affecting the supply and demand for a product or commodity. Awareness of current and forecasted economic conditions assists in the development of purchase budgets and material forecasts, and also provides valuable insights when developing future price negotiating strategies. One good source of information is the website for the Institute for Supply Management, www.ism.ws, which presents key data on pricing trends for a

variety of commodities. Other sources of pricing trends in commodity markets can be found in industry-specific trade associations, such as Pulp and Paper World (for prices on different grades of pulp and paper: www.paperloop.com), or Textile World (for prices on Texas, Memphis, and California cotton: www.textileworld.com).

## Pricing Strategy of the Seller

Sellers pursue different strategies or approaches that affect the pricing of their products or services. Some sellers rely on a detailed analysis of internal cost structures to establish price, whereas others simply price at a level comparable to the competition.

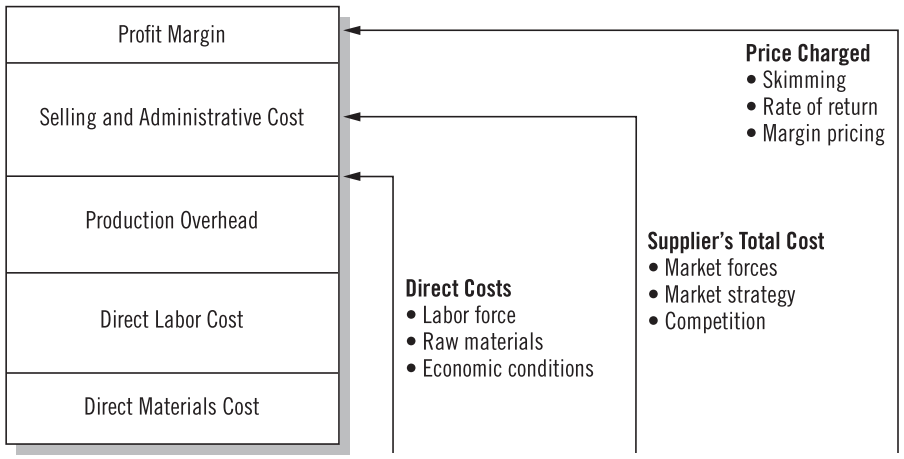
The pricing strategy of the seller has a direct impact on quoted prices. In order to remain in business, suppliers must cover their costs and earn an overall profit to provide for meeting their corporate objectives. In many cases, however, the price charged by a seller may have little or no relationship to actual costs. As strange as this seems, pricing strategies are often based on other factors that are important to the seller. A seller may quote an unusually low price to secure a purchase contract, with the intention of raising the price once it drives competition from the marketplace. In other cases, the seller may exploit its position when it senses it has the purchaser over a barrel by charging an excessive price. In still other cases, the seller may simply not understand its own costs.

Several questions should be asked when analyzing a seller's pricing strategy. These include the following:

- Does the seller have a long-term pricing strategy, or is it short-term in nature?
- Is the seller a price leader (sets new pricing levels in the market), or a price follower (only matches price increases/decreases when the competition does so)?
- Is the seller attempting to establish entry barriers to other competitors by establishing a low price initially, then preparing to raise prices in the future?
- Is the seller using a cost-based pricing approach, which develops price as a function of true costs, or a market-based pricing approach? If a market-based pricing approach is being used, there may be little need for conducting a detailed cost analysis, as the price charged may be unrelated to any elements of cost.

The elements that make up the price charged by a supplier are shown in Exhibit 11.6. Essentially, the supplier's costs include materials and labor (which together make up manufacturing cost), plus overhead and sales, general and administrative expenses (which cumulatively establish the supplier's total cost), plus margin, which then equates to the price charged. Based on the interplay between these different elements, which may vary depending on the supplier's pricing model, the price charged to a buyer can vary significantly. Seller pricing strategies can be grouped into two categories: market-driven models and cost-based models. As we noted earlier, price analysis involves having the supply manager gauge the pricing strategy used by the supplier, without going into the details of how its detailed cost elements are established. We will cover market-driven pricing models first, then cover cost analysis techniques later in the chapter.

**Exhibit 11.6** Elements of Price and Associated Cost Drivers




# Market-Driven Pricing Models[2]

## Price Volume Model

In the price volume model, the supplier analyzes the market to find the combination of price per unit and quantity of sales that maximizes its profit on the assumption that (1) lowering the price will result in more units being sold, and (2) greater volume will spread the indirect cost over more units, therefore maintaining or even increasing the profit as it relates to the price. The most basic example of this model is the supplier's offering quantity price breaks to induce the buyer to purchase in larger quantities (a core approach adopted by Sam's Club and Costco stores). Strategic sourcing initiatives should always engage a thorough analysis of the relationship between price and quantity in different marketplaces.

Combining purchase requirements across separate operating units can yield savings in tooling, setup, and operating efficiencies. A major benefit of reduced or single sourcing is a lower price that results from the higher volumes offered to a supplier. In return for a purchase contract with higher volumes, a buyer expects favorable pricing because a supplier should realize lower per-unit costs. The willingness of a supplier to offer quantity discounts also affects the final selling price.

Although a quantity discount has a positive effect on the purchase price, a purchaser must be cautious about the net impact on the total cost of the item. Buying in larger-than-normal quantities requires additional storage of purchased goods. At a time when most firms are reducing or even eliminating inventory, the additional inventory-carrying costs must be evaluated against the benefit of the quantity discount.

## Market-Share Model

In the market-share model, pricing is based on the assumption that long-run profitability depends on the market share obtained by the supplier. This approach, also referred to as "penetration pricing," is an aggressive pricing approach for efficient

## Sourcing Snapshot

## *Higher Pipeline Costs Forecast*

Across the board, one of the biggest challenges facing the pipeline supply market today is human resources. Indeed, the issue of available personnel was one of the primary topics of discussion at the *Pipeline and Gas Journal*'s third annual Pipeline Opportunities[3] Conference held in March 2007. Many operators and service providers expressed concerns about an aging workforce and the lack of younger people moving into the industry. Senior executives expressed concern that the personnel crisis could have some severe impacts on future pipeline development. As one executive noted, "We in the pipeline industry have been successful with the pipeline contractors in placing in service a number of large projects on time and on budget. At the same time we have another slate of projects where we haven't been as successful. They were either delayed or had significant cost overruns."

There are several reasons for this recent phenomenon.

One of the root causes is that much of the existing infrastructure in pipelines has outlived its useful life. A significant amount of existing pipe in the United States was put in the ground in the 1930s and 1940s, and was designed to have a lifetime of 40 years. Today, 70 years down the path, much of this pipeline now has to be replaced. This has not gone unnoticed by the Department of Transportation, which regulates 85–90% of pipeline activity. Two years ago, new regulations on the nation's pipelines dictated that anyone that was moving liquids had to inspect all of these pipelines by 2007 (by 2009 for gas pipelines). The unfortunate fact is that much of the infrastructure has not been inspected in years, and most oil and gas companies have never inspected them for corrosion.

To cope with this situation, oil and gas companies, and engineering, procurement, and construction companies are running smart gauges through the infrastructure (magnetic calipers that run through the pipe). These companies are realizing that in general much of the pipe is in awful shape. To repair the pipe, maintenance crews have to expose it, identify the extent to which the corrosion exists, and decide whether to keep it or not. If not, the pipe must be replaced. As a result, there has been a huge boom in inspection, maintenance, and replacement of the existing pipelines, which has drawn significantly on the labor resources for pipeline engineering and tank maintenance crews.

Certain Western regions such as the Barnett Shale area in Texas, new finds in Colorado, as well as discoveries in the other lower 48 states will drive new demand, as these geographies have no infrastructure and are being developed. As a result there is a rush to develop new pipelines as well—another draw on resources.

Another draw is the vast number of other major projects under way globally. For example, a new LNG program in Louisiana uses the same labor classifications. The energy industry in the Gulf Coast region is undergoing an impressive expansion with projects worth about $260 billion under development. Contributing to this outstanding growth is the simultaneous peaking of all three sectors of the industry—upstream, midstream, and downstream—happening for the first time in many years. Strong global oil demand growth, fueled primarily by the emergence of China and India as new world economic powerhouses, and availability of reliable low-cost feedstock in the Gulf Coast have provided an ideal opportunity for the region's energy industry to move up the value chain and add refining and petrochemical capacity. This euphoria has contributed to a glut of projects, amounting to 3 million barrels per day of

refining capacity and 32 million tonnes per annum of petrochemical plants, under development in the region. This is also drawing on this labor pool.

Source: R. Handfield, "The Pipeline Engineering Labor Market," white paper, Supply Chain Resource Cooperative, October 2007.

producers because price is a direct function of cost. Penetration pricing can lead to faster market penetration for a product because of the lower profit margins a seller is willing to accept. Generally speaking, the seller is willing to take a lower price because of the potential mass market appeal of the product, resulting in substantially higher sales volumes. In the initial stages of this model, the supplier may even accept losses, but as its volume increases, the cost per unit decreases and long-term profits are achieved. A word of caution is in order here: Purchasers should question whether the seller is the most efficient producer willing to accept lower margins to win market share, or is the real intention to drive competition from the marketplace and later raise prices to exorbitant levels?

## Market Skimming Model

In the market skimming model, prices are set to achieve a high profit on each unit by selling to supply managers who are willing to pay a higher price because of a lack of purchasing sophistication or who are willing to pay for products or services of perceived higher value. An example of the application of this model is frequently seen by supply managers in the use of backdoor selling to non-purchasing professionals in the firm. Supply managers should always seek to reduce the potential negative impact of this pricing model by cost, price, or value analysis to ensure that the higher price for the product or service is justified by the reported additional benefits. A good example of this situation is shown in Sourcing Snapshot: Higher Pipeline Costs Forecast, where the pipeline engineering industry is faced by so much demand for projects that it is literally in a supplier's market and can charge higher-than-normal prices for their services.

## Revenue Pricing Model

When downturns in market demand occur, suppliers often must resort to a current revenue pricing model. The emphasis of this model is on obtaining sufficient current revenue to pay for operating cost rather than on profit. Suppliers using this strategy are typically concerned about capacity utilization, covering fixed costs, and retaining skilled labor during market slowdowns, when they are willing to reduce their prices until market conditions change. However, supply managers should be on guard for negative impacts on quality and service resulting from cost cutting on the part of the supplier.

## Promotional Pricing Model

The promotional pricing model presents pricing for individual products and services that is set to enhance the sales of the overall product line rather than to ensure the profitability of each product. Current examples of this are the sale of cell phones at below cost in order to induce consumers to buy the annual service contract, or the use of extremely low prices for printers that require the use of the supplier's highly

## Exhibit 11.7 Example of Iron Castings PPI Data

**SERIES ID:** PCU3321#4 (N)
**INDUSTRY:** GRAY IRON FOUNDRIES
**PRODUCT:** OTHER GRAY IRON CASTINGS
**BASE DATE:** 8606

| YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1993 | 111.1 | 111.5 | 111.5 | 111.6 | 111.8 | 111.7 | 111.8 | 111.6 | 111.4 | 111.4 | 112.0 | 112.3 | 111.6 |
| 1994 | 112.4 | 112.5 | 112.7 | 113.2 | 113.5 | 113.7 | 113.8 | 114.0 | 115.1 | 115.2 | 115.6 | 115.7 | 114.0 |
| 1995 | 116.8 | 118.5 | 118.7 | 118.7 | 118.7 | 118.7 | 119.4 | 120.6 | 120.8 | 121.2 | 121.3 | 121.6 | 119.6 |
| 1996 | 122.5 | 122.8 | 122.9 | 122.9 | 122.8 | 122.9 | 122.9 | 123.1 | 122.5 | 123.3 | 123.4 | 123.3 | 122.9 |
| 1997 | 123.3 | 123.1 | 123.2 | 123.1 | 123.2 | 123.2 | 123.3 | 123.0 | 123.5 | 123.5 | 123.1 | 123.2 | 123.2 |
| 1998 | 123.3 | 123.6 | 123.5 | 123.6 | 123.6 | 123.7 | 123.7 | 123.7 | 124.3 | 124.2 | 123.9 | 124.7 | 123.8 |
| 1999 | 124.6 | 124.7 | 124.7 | 124.6 | 124.7 | 124.7 | 124.7 | 124.8 | 124.8 | 124.8 | 124.4 | 124.4 | 124.7 |
| 2000 | 126.0 | 126.0 | 126.1 | 126.1 | 126.3 | 126.4 | 126.3 | 126.2 | 126.3 | 126.2 | 126.1 | 126.1 | 126.2 |
| 2001 | 126.0 | 125.9 | 126.0 | 126.0 | 126.0 | 126.0 | 126.0 | 126.0 | 126.2 | 126.1 | 126.2 | 126.1 | 126.0 |
| 2002 | 126.1 | 126.1 | 126.2 | 126.4 | 126.7 | 126.7 | 126.8 | 126.8 | 127.3 | 127.4 | 127.2 | 127.2 | 126.7 |
| 2003 | 127.1 | 127.2 | **127.2** | 126.8 | 126.8 | **127.5** | 127.7(P) | 127.6(P) | 127.6(P) | 127.7(P) | | | |

N: NAICS replaces SIC with PPI data for January 2004. See http://www.bls.gov/ppi/ppinaics.htm. P: Preliminary. All indexes are subject to revision four months after original publication.

profitable ink cartridges. Total cost of ownership (TCO) analysis (discussed later in the chapter) should be used to avoid surprising and unfavorable financial impacts that can result from dealings with suppliers using this model.

### Competition Pricing Model

The competition pricing model focuses on pricing actions or reactions to pricing proposals offered or expected to be offered by the supplier's competitors. The pricing strategy is based on determining the highest price that can be offered to the supply manager that will still be lower than the price offered by competitors. An excellent example of this model is the reverse auction process.

### Cash Discounts

The practice in most industries is to offer incentives to pay invoices promptly. One way to encourage this is to offer cash discounts for payment within a certain period of time. For example, a seller may offer a discount of 2% for invoice payment within 10 days of receipt. The seller usually expects full payment within 30 days. (This is often expressed as "2% 10/net 30.")

Unlike quantity discounts, it is usually worthwhile to take advantage of cash discounts. Purchasers can rarely earn the equivalent return within a 10-day period of transactions offered with a cash discount. The opportunity cost of not taking the discount is almost always higher than the opportunity cost of taking the discount. Well-managed firms take advantage of cash discounts and arrange payment within the specified time frame.

Understanding the pricing model used by suppliers can provide supply managers with significant insights into the strategies needed to generate cost savings for their firm.

## Using the Producer Price Index to Manage Price

As noted earlier, price analysis is appropriate for certain types of commodities. Specifically, monitoring price instead of cost is appropriate for market-based products where pricing is largely a function of supply and demand. Examples include steel, paper, plastic, and other types of bulk commodities. When assessing whether the price charged is fair compared with the market, managers can compare price changes for a purchase family to an external index. An important factor when conducting a price analysis is the Producer Price Index (PPI), which is maintained by the U.S. Bureau of Labor Statistics.

This information can easily be downloaded from the Bureau of Labor Statistics web page (www.bls.gov). The index tracks material price movements from quarter to quarter. It is scaled to a base year (1988) and tracks the percentage increase in material commodity prices based on a sample of industrial purchasers. By converting price increases paid from quarter to quarter into a percentage increase, and comparing the changes to the PPI for a similar type of material, the purchaser can determine whether the price increases paid to the supplier of that material are reasonable.

To use this tool, users will first need to identify the supplier's standard industrial code (SIC). This can be found at www.FreeEDGAR.com. Next, look at the price index for the SIC and product that you are interested in. Consider the following example for iron castings. The PPI for iron castings is shown in Exhibit 11.7.

Price paid to supplier on March 30, 2008: $52.50/unit

Price paid to supplier on June 30, 2008: $53.20/unit

Percentage price increase = ($53.20 – $52.50)/$52.50 = 1.33%

Steel castings PPI (March 30, 2008) = 127.2

Steel castings PPI (June 30, 2008) = 127.5

Percentage inflation for steel castings = (127.5 – 127.2)/127.2 = 0.2%

In this case, the price increase paid by the purchaser is over five times as much as the increase in the PPI for iron castings—surely an unreasonable increase! The purchaser should definitely question the supplier about this recent price increase, and negotiate a better price!

In addition to PPI data, the Bureau of Labor Statistics website also contains information on labor rates in different regions of the country, and updates on pricing and market conditions. Information on employment cost data is also available in *Purchasing* magazine's "Buying Strategy Forecast," a semimonthly newsletter, and the Direct-ICE report prepared by Thinking Cap Solutions (www.ice-alert.com). Other sources of commodity price information are the "Pink Sheets" published by the World Bank (www.worldbank.org/prospects).

Some companies set an objective of consistently bettering price inflation with suppliers. That is, they expect that performance should be better than the market.

As shown in Exhibit 11.8, this can provide the company with a relative competitive advantage in terms of pricing. Caution should be used when applying PPI data that match the commodity being purchased. The buyer should carefully study the history of the index to ensure that it has a strong correlation with the price history of the commodity being purchased. Several questions should be asked in this situation:

**Exhibit 11.8** Actual Price Change vs. Market Index Change—Graphical View

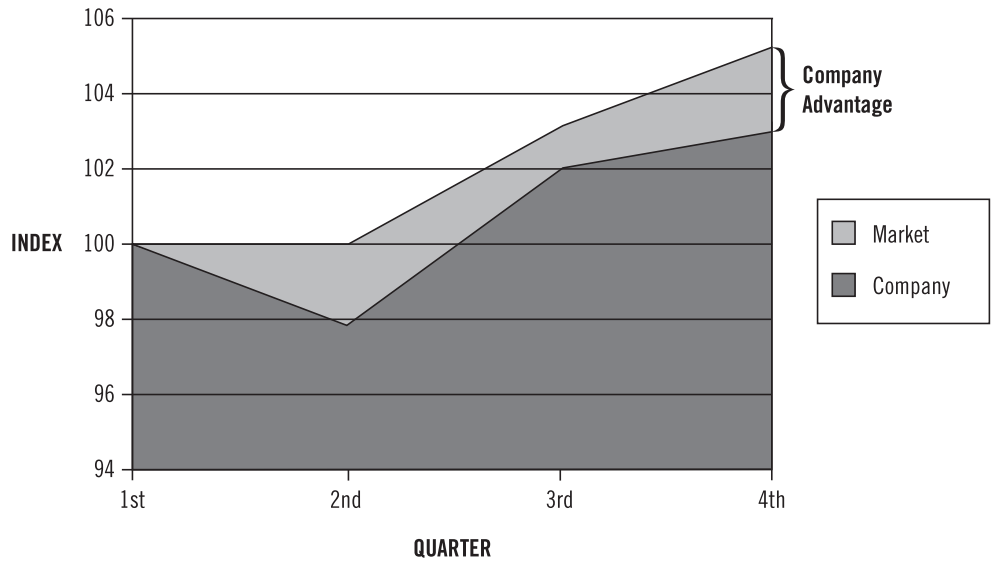


**Exhibit 11.9** Actual to PPI Comparison

| | PPI 9/02 | PPI 9/03 | % CHANGE | ACTUAL 9/02 | ACTUAL 9/03 | % CHANGE |
|---|---|---|---|---|---|---|
| Gasoline | 90.3 | 109.9 | 21.7 | 100.0 | 115.0 | 15.0 |
| Lumber | 169.9 | 184.5 | 8.6 | 100.0 | 110.0 | 10.0 |
| Paper | 186.8 | 190.7 | 2.0 | 100.0 | 102.0 | 2.0 |

Source: PPI data from U.S. Bureau of Labor Statistics, http://stats.bls.gov/ppihome.htm.

- How did the purchasing situation affect the price fairness and reasonableness at the time?
- How have conditions (e.g., delivery requirements) changed?
- What is the effect on price of changes in the quantity of a material or service purchased?
- Was the purchasing situation a sole source or competitive source?
- Are the index comparisons driving purchasing strategies?

A real benefit of using this price analysis approach is to track price changes across different commodities and compare performance. For example, consider the following.

Three sourcing teams are discussing their cost results for the past year:

Gasoline team: 15% cost increase

Lumber team: 10% cost increase

Paper team: 2% cost increase

Which team has been most effective at managing costs for the year?

At first glance, it would appear that the paper team is doing the best because they have the lowest cost increases (2%). However, in comparing the results with the PPI data shown in Exhibit 11.9, the picture is markedly different. The lumber team has failed to capture savings in a market that has seen prices increase by only 8.6%, while the paper team has limited price increases to 2%, which is only par for the course in terms of what is happening in the market. The gasoline team, however, has been able to contain price increases to 15% in the face of a market that has seen gas prices increase by more than 21%, largely due to speculation associated with the Iraq war during this period. This analysis can help identify different price changes in markets where a fair and open market is present.

## Cost Analysis Techniques

As noted earlier, more and more organizations are shifting their attention away from price management and toward cost management. In so doing, there may be opportunities to reduce costs that are not available when the discussion focuses only on price. In cost analysis, the supply manager performs a detailed analysis of the different elements of costs shown earlier in Exhibit 11.6 and identifies what is driving the different elements.

# Cost-Based Pricing Models[4]

## Cost Markup Pricing Model

In this model, the supplier simply takes its estimate of costs and adds a markup percentage to obtain the desired profit. This markup percentage could be added to the product cost only (usually direct materials plus direct labor plus production overhead), in which case the markup would have to provide for profit, plus all other indirect costs of operating the business. However, if the markup is applied to the total cost (product cost plus general, administrative, and sales expenses), then the markup is solely profit to the supplier. For example, a supplier that wanted a 20% markup over its total cost of $50 would quote a price of $60 ($50 + (20% of $50) = $60), which would leave a profit of $10.

## Margin Pricing Model

In the margin pricing model, the supplier is still attempting to obtain a profit related to its costs, but instead of adding a markup to cost, the supplier establishes a price that will provide a profit margin that is a predetermined percentage of the quoted price (i.e., not a percentage of cost, as in markup pricing). For example, the supplier discovered that last year its margin as a percentage of sales was 1%, and this year the supplier would like it to be 20%. Using the same total cost of $50 as above would result in the supplier quoting a price of $62.50 in order to obtain the margin of 20%. This is calculated using the new equation for margin pricing:

$$\text{Cost} + (\text{Margin Rate} \times \text{Unit Selling Price}) = \text{Unit Selling Price}$$

Using simple algebra, solving the equation for unit selling price results in the formula:

$$\text{Cost}/(1 - \text{Margin Rate}) = \text{Unit Selling Price}$$

or

$$(\$50)/(1 - 20\%) = \$62.50$$

As in cost markup pricing, the supply manager must be aware if the margin pricing is based on product cost only or if it's based on total cost.

## Rate-of-Return Pricing Model

A third common model in the cost-based category is the rate-of-return pricing model, wherein the desired profit is added to the estimated cost. In this model, the supplier bases the profit on the objective of a specific desired return on the financial investment, rather than on the estimated cost. For example, if the supplier wanted a 20% return on its investment of $300,000 (which might include R&D, equipment, engineering, or other elements), to make 4,000 parts with a total cost of $50 each, the quoted price would be $65, using the following approach:

$$\text{Unit Cost} + \text{Unit Profit} = \text{Unit Selling Price}$$

$$\$50 + ((20\% \times 300{,}000)/4{,}000) = \$65$$

# Product Specifications

Whether they realize it or not, purchasers impact price at the time they set the specifications for the product or service. Specifying products or services requiring custom design and tooling affects a seller's price, which is one of the reasons purchasers try

to specify industry-standard parts whenever possible. Cost (and hence price) becomes higher as firms increase the value-added requirements for an item through design, tooling, or engineering requirements. Purchasers should specify industry-accepted standard parts for as much of their component requirements as possible and rely on customized items when they provide a competitive product advantage or help differentiate a product in the marketplace.

The ability to perform a cost analysis is a direct function of the quality and availability of information. If a purchaser and seller maintain a distant relationship, cost data will be more difficult to identify due to the lack of support from the seller. An obvious approach that can help in obtaining necessary cost data is to require a detailed production cost breakdown when a seller submits a purchase quotation. The reliability of self-reported cost data must be considered. Another approach or option involves the joint sharing of cost information. A cross-functional team composed of engineers and manufacturing personnel from both companies may meet to identify potential areas of the supplier's process (or the purchaser's requirements) that can potentially reduce costs. One of the benefits of developing closer relations with key suppliers is the increased visibility of supplier cost data. The following section details some techniques that focus on cost.

## Estimating Supplier Costs Using Reverse Price Analysis

Often suppliers will not be forthcoming in sharing cost data. In these situations, the purchaser must resort to a different type of analytical approach called "reverse price analysis" (also known as "should cost" analysis). A seller's cost structure affects price because, in the long run, the seller must price at a level that covers all variable costs of production, contributes to some portion of fixed costs, and contributes to some level of profit. As discussed later in the chapter, many suppliers are reluctant to share internal cost information. This information, however, is valuable to a purchaser, particularly when evaluating whether a supplier's price is justifiable and reasonable. In the absence of specific cost data, a supplier's overall cost structure must be estimated using a cost analysis—meaning that if the supplier is assigning costs in an appropriate manner, what should the product cost based on these calculations?

Information about a specific product or product line is often difficult to identify. A purchaser may have to use internal engineering estimates about what it costs to produce an item, rely on historical experience and judgment to estimate costs, or review public financial documents to identify key cost data about the seller. The latter approach works best with publicly traded small suppliers producing limited product lines. Financial documents allow estimation of a supplier's overall cost structure. The drawback is that these documents do not provide much information about a specific breakdown of cost by product or product line. Also, if a supplier is a privately held company, cost data become difficult to obtain or estimate.

Despite these difficulties, there are tools available that can be used to estimate a supplier's cost using some publicly available information. When evaluating a supplier's costs, the major determinants of a supplier's total cost structure must be taken into consideration. Let's assume a purchasing manager is buying a product or service for the first time without experience of what fair pricing might be. Because they don't have the tools at hand, or because they're too busy, many purchasers' usual technique is to go with their gut feel or to evaluate competitive bids. It may be worth the time and effort, however, to perform some additional research using data from an income statement or from Internet sites. In doing so, the purchaser may perform a

**Exhibit 11.10 Data Sources**

- Labor: *Annual Survey of Manufacturers*—total direct labor and material for SIC codes
- Overhead: 150% for labor intensive, as high as 600% for capital intensive
- Materials and Profit: Robert Morris Associates data broken out by SICs including the following:
  - Income sources
  - Gross profit margins
  - Percentages for operating expenses
  - Percentages for all other expenses
  - Before-tax profit percentages

**Other Sources of Data**

Financial reports (profit and SGA estimates):

- Ward's Industrial Directory Census of Manufacturers
- Yahoo! financial section (biz.yahoo.com)
- Morningstar (www.morningstar.com)
- Marketwatch (cbs.marketwatch.com)
- 411Stocks (www.411stocks.com)
- The Street (www.thestreet.com)
- Thinking Cap Solutions (www.ice-alert.com)

reverse price analysis—which essentially means breaking down the price into its components of material, labor, overhead, and profit.

Let's start the process with a supplier-provided price of $20 per unit. The first component to consider is the price contribution toward profit, and sales, general, and administrative (SGA) expenses. For publicly traded companies, this can be estimated by looking at a variety of websites that provide information on financial reports, including balance sheets, income statements, cash flow statements, and annual reports shown in Exhibit 11.10 under the "Financial Reports" section.

Exhibit 11.10 provides a list of available data sources for other components of cost. For this example, assume the purchaser determined that the supplier is a privately held company. This is still not a problem, assuming the buyer can look up the supplier's SIC code (www.FreeEDGAR.com). Another useful resource is Robert Morris Association (www.rmahq.org), which publishes the gross profit margin for this SIC overall, as well as before-tax profit percentages. Although this is a rough estimate, it does offer a good starting point. In Exhibit 11.11, the gross profit and SGA expense percentage for this supplier's SIC code is 15%. Thus on a price of $20 the estimated profit is $3. Next, the purchaser will need to understand the labor and material cost components of price.

Material costs can often be estimated by consulting with internal engineers. Using an estimate of required material, as well as external information on current pricing of these materials (as shown in the previous section), a rough estimate can be made of the amount of material in the product. In our example, we discovered that an approximation of the amount of material included is 20% of the price, or $4.

To find out how much labor is included, the best place to look is the *Annual Survey of Manufacturers,* published by the U.S. Department of Commerce and available

**Exhibit 11.11 Reverse Price Analysis**

| | |
|---|---|
| Hypothetical price | $20 |
| Profit/SG&A allowance (15%) | −$ 3 |
| Subtotal | $17 |
| Direct material | −$ 4 |
| Subtotal | $13 |
| Direct labor | −$ 3 |
| Manufacturing burden | =$10 |

at www.census.gov/prod/www/abs/industry.html. This site allows the purchaser to download information on total direct-labor costs and total material costs for any SIC number. This information allows the purchaser to calculate a materials-to-labor ratio. For the analysis shown in Exhibit 11.11, suppose that the purchaser discovered that the ratio of materials to labor based on the SIC code was 1.333. Thus, if material costs were previously estimated at $4, then direct-labor costs should be approximately $3 (4/1.333).

After subtracting the estimates for profit/SGA, materials, and labor from the price, the remaining portion of cost is considered manufacturing burden or overhead. At this point, the purchaser must determine whether $10 per unit paid on a price of $20 per unit is a reasonable amount for overhead costs. Typically, overhead is expressed as a percentage of labor costs. For labor-intensive industries, the ratio could be as low as 150%. For capital-intensive industries, it could be as high as 600%. In our example, the overhead rate is 333% of labor ($10/$3). Using other data from Robert Morris Associates, the purchaser can also estimate the percentages for operating expenses and for all other expenses. With this cost estimate in hand, the purchaser should now be able to approach the supplier in a negotiation and initiate a discussion that addresses price and cost. Although these estimates may not be 100% accurate, they provide a baseline for discussion of the supplier's cost structure.

Labor cost will be an increasing factor in many cost estimates. The period from 2007 to 2015 will see the next impact of the baby boomer population on society. This impact will be in terms of a large number of people from this group retiring and leaving the work force. The number of retirees from multiple industries is expected to reach levels that have never been seen previously.

At the same time, the U.S. economy will continue to grow, and the demand for labor will escalate proportionately. Given the movement toward the service economy, the need for labor in selected industries is expected to grow significantly. Experts believe that services will be most affected, with a 29% growth rate. Transportation, retail trade, construction, and wholesale trade labor demand will also increase by double digits during this period. In construction alone, demand for drilling, specialty trades, and refining positions will increase by 17 to 18% during this period.

In discussing the supplier's cost structure with the supplier and how it applies to the price paid, the purchaser should attempt to initiate discussion in the following areas to discover opportunities for cost reductions.

- *Plant utilization.* The cost impact of additional business on the operating efficiency of a supplier should be evaluated. Is a supplier currently operating at capacity? Will additional volume actually create higher costs through

overtime? Or will a supplier be able to reduce its cost structure through additional volume? The utilization rate of productive assets contributes directly to a supplier's cost structure.

- *Process capability.* The purchaser should also consider if projected volume requirements match a supplier's process capability. It may be inefficient to source smaller lot sizes with a supplier that requires long runs to minimize costs. On the other hand, suppliers specializing in smaller batches cannot efficiently accommodate volumes requiring longer production runs. A supplier's production processes should match a purchaser's production requirements. Purchasing should also evaluate production processes to determine if they are state-of-the-art or rely on outdated technology. Production and process capability influences operating efficiencies, quality, and the overall cost structure of a seller.
- *Learning-curve effect.* Learning-curve analysis indicates whether a seller can lower its cost as a result of the repetitive production of an item.
- *The supplier's workforce.* A supplier's labor force affects the cost structure. Issues such as unionized versus nonunionized, motivated versus unmotivated, and the quality awareness and commitment of employees all combine to add another component to the cost structure. When visiting a supplier's facility, representatives from the purchaser should take the time to talk with employees about quality and other work-related items. Meeting with employees provides valuable insight about a supplier's operation. In recent years, the cost of labor in the workforce has gone up dramatically (see Sourcing Snapshot: The Rising Cost of Welders).
- *Management capability.* Management affects costs by directing the workforce in the most efficient manner, committing resources for longer-term productivity improvements, defining a firm's quality requirements, managing technology, and assigning financial resources in an optimal manner. Management efficiency and capability have both a tangible and intangible impact on a firm's cost structure. In the end, every cost component is a direct result of management action taken at some point in time.
- *Purchasing efficiency.* How well suppliers purchase their goods and services has a direct impact on purchase price. Suppliers face many of the same uncertainties and forces in their supply markets that purchasers face. Supplier visits and evaluations should evaluate the tools and techniques suppliers use to meet their material requirements.

## Break-Even Analysis

Break-even analysis includes both cost and revenue data for an item to identify the point where revenue equals cost, and the expected profit or loss at different production volumes.

Firms perform break-even analysis at different organizational levels. At the highest levels, top management uses this technique as a strategic planning tool. For example, an automobile manufacturer can use the tool to estimate expected profit or loss over a range of automobile sales. If the analysis indicates that the break-even point in units has risen over previous estimates, cost-cutting strategies can be put in place. Divisions or business units can use the technique to estimate the break-even point for a new product line.

## Sourcing Snapshot

### *The Rising Cost of Welders*

There is a chronic shortage of young people who are seeking a career in welding or as electricians, boilermakers, pipefitters, or other trade-school craft labor positions. Let's focus for a moment on welders as a case study that is representative of this problem. With estimates that nearly half of the skilled welders available today are nearing retirement, the recruitment of younger people into the welding industry has become an important issue. The American Welding Society (AWS) has estimated that there will be a shortage of more than 200,000 skilled welders by 2010 in the United States, and the U.S. Department of Labor reports that the number of welders employed in the United States declined about 10% to 576,000 in 2005—the last full year for which data is available—from 594,000 in 2000.[5]

"One of the welding industry's biggest challenges is attracting young talent, which is attributable in large part to its tarnished image," said Dennis Klingman, AWS Education Committee chairman. "Many people still associate welding with black-and-white photos of tired welders covered in scuffmarks and dressed in soiled clothing. But the welding industry has undergone dramatic changes with the advancement of technology, and is no longer confined to the dark and dirty setting reminiscent of the last century's industrial era. Despite this, there continues to be an image problem, and parents, instructors, and counselors have been hesitant to introduce students to the industry."

In a recent interview, an expert noted the following:

> We need to reach out to 17 and 18 year olds, who currently don't understand that you can do very well in these roles. The skilled labor part of the world—engineers, mechanics, and electricians—in building our infrastructure—will cause us to struggle, when people are leaving the workforce. In some of these trades this is a narrow window. You can only be a productive welder for 15–20 years, and it is hard work, dirty work. What are the demographics for welders? I would suspect that most last until they are 30–40 and most don't do it into their 50s. It is backbreaking labor. We are going to be in for an eye-opening experience.

There has also been a huge draw on the demand for new infrastructure. The nation's infrastructure has not been upgraded in a very long time. In addition, there are multiple geographical areas undergoing significant development, which will put additional pressure on demand for labor.

Source: R. Handfield, "The Human Talent Factor in the Supply Chain," white paper, Supply Chain Resource Cooperative, December 2007.

Purchasing and supply chain specialists use break-even analysis to develop the following insights:

- Identify if a target purchase price provides a reasonable profit to a supplier given the supplier's cost structure.
- Analyze a supplier's cost structure. Break-even analysis requires detailed analysis or estimation of the costs to produce an item.
- Perform sensitivity (what-if) analysis by evaluating the impact on a supplier of different mixes of purchase volumes and target purchase prices.

- Prepare for negotiation. Break-even analysis allows a purchaser to anticipate a seller's pricing strategy during negotiations. Research indicates that a direct relationship exists between preparation and negotiating effectiveness.

Break-even analysis requires the purchaser to identify the important costs and revenues associated with a product or product line. Graphing the data presents a visual representation of the expected loss or profit at various production levels. Cost equations also express the expected relationship between cost, volume, and profit. When using break-even analysis, certain common assumptions are typically used:[6]

1. Fixed costs remain constant over the period and volumes considered.
2. Variable costs fluctuate in a linear fashion, although this may not always be the case.
3. Revenues vary directly with volume. This is represented graphically by an upward-sloping total revenue line beginning at the origin.
4. The fixed and variable costs include the semivariable costs. Thus no semivariable cost line exists.
5. Break-even analysis considers total costs rather than average costs. However, the technique often uses the average selling price for an item to calculate the total revenue line.
6. Significant joint (i.e., shared) costs among departments or products limits the use of this technique if these costs cannot be reasonably apportioned among users. If shared costs cannot be apportioned, then break-even analysis is best suited for the entire operation versus individual departments, products, or product lines.
7. This technique considers only quantitative factors. If qualitative factors are important, management must consider these before making any decisions based on the break-even analysis.

## Break-Even Analysis Example

The following example assumes that fixed costs, variable costs, and target purchase price for a single item are reasonably accurate. The construction of a break-even graph requires these three pieces of information.

Exhibit 11.12 shows the required cost and volume data along with the break-even graph for this example. Because a buyer is estimating the break-even analysis for a supplier, the price is a target purchase price established by the purchaser. A range of prices can be analyzed to estimate a supplier's expected profit or loss given the fixed and variable costs.

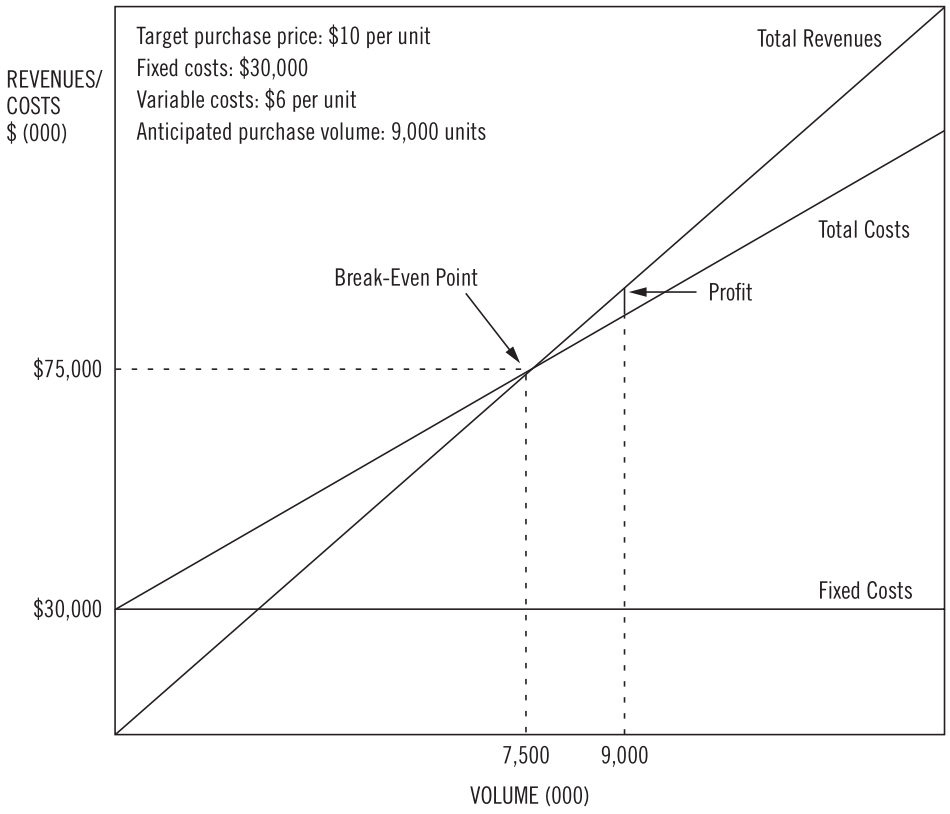
In this example, the purchaser wants to determine if the anticipated volume of 9,000 units provides an adequate profit for the supplier at the target purchase price.

Exhibit 11.12 indicates that the supplier requires at least 7,500 units to avoid a loss with this cost structure and target purchase price. The following equation identifies the profit or loss associated with a given volume:

$$\text{Net Income or Loss} = (P)(X) - (VC)(X) - (FC)$$

where P = average purchase price, X = units produced, VC = variable cost per unit of production, and FC = fixed cost of production for an item.

**Exhibit 11.12** Break-Even Analysis for Supplier XYZ




The supplier's expected profit for the anticipated 9,000 units is calculated as follows, using $10 per unit as the average purchase price:

$$\begin{aligned}\text{Net Income} &= (\$10)(9{,}000) - (\$6)(9{,}000) - (\$30{,}000)\\ &= \$60{,}000 \text{ Profit}\end{aligned}$$

We can also calculate the number of units the supplier needs to produce to break even (i.e., cover fixed costs). This is calculated as follows:

$$\begin{aligned}\text{Total Revenue} &= \text{Variable Cost} + \text{Fixed Cost}\\ \$10(X) &= \$6(X) + \$30{,}000\\ \$4(X) &= \$30{,}000\\ X &= 75{,}000 \text{ units}\end{aligned}$$

If the cost data are accurate, then the anticipated purchase volume provides a profit to the supplier, because it exceeds 7,500 units. Whether this is an acceptable profit level given the cost structure is an issue both parties may have to negotiate. If the analysis indicates that the purchase volume results in an expected loss to the seller, then a purchaser must consider several important questions:

- Is the target purchase price too optimistic given the supplier's cost structure?

- Are the supplier's production costs reasonable compared with other producers in the industry?
- Are the cost and volume estimates accurate?
- If the cost, volume, and target price are reasonable, is this the right supplier to produce this item?
- Will direct assistance help reduce costs at the supplier?

This method allows an evaluation of a supplier's expected profit over a range of costs, volumes, and target purchase prices. The break-even technique, however, often provides only broad insight into a purchase decision.

## Total Cost of Ownership

Total cost of ownership requires a purchaser to identify and measure costs beyond the standard unit price, transportation, and tooling when evaluating purchase proposals or supplier performance. Formally, **total cost of ownership** is defined as the present value of all costs associated with a product, service, or capital equipment that are incurred over its expected life.

Most large firms base purchase decisions and evaluate suppliers on cost elements beyond unit price, transportation, and tooling. Research indicates, however, that companies differ widely about what cost components to include in a total cost analysis.

Typically these costs can be broken into four broad categories:[7]

- *Purchase price.* The amount paid to the supplier for the product, service, or capital equipment.
- *Acquisition costs.* All costs associated with bringing the product, service, or capital equipment to the customer's location. Examples of acquisition costs are sourcing, administration, freight, and taxes.
- *Usage costs.* In the case of a product, all costs associated with converting the purchased part/material into the finished product and supporting it through its usable life. In the case of a service, all costs associated with the performance of the service that are not included in the purchase price. In the case of capital equipment, all costs associated with operating the equipment through its life. Examples of usage costs are inventory, conversion, scrap, warranty, installation, training, downtime, and opportunity costs.
- *End-of-life costs.* All costs incurred when a product, service, or capital equipment reaches the end of its usable life, net of amounts received from the sale of remaining product or the equipment (salvage value) as the case may be. Examples of end-of-life costs are obsolescence, disposal, clean-up, and project termination costs.

### Building a Total Cost of Ownership Model

Building a TCO model is not an easy task. It requires input from different parts of the organization and a thorough understanding of the process through the entire life cycle. The following steps must be taken to ensure that all costs are captured correctly:

*Step 1.* Map the process and develop TCO categories. Construct a process map from the time a need for the product, service, or capital equipment is identified all the way through the life cycle. The activities that you identify will help to develop broad TCO categories.

*Step 2.* Determine cost elements for each category. Using the process map as a guide, identify the subcost elements that make up each TCO category.

*Step 3.* Determine how each cost element is to be measured. This is a critical step. The metrics must be determined to quantify each of the cost elements identified in Step 2. For example, to quantify the costs of sourcing labor, the hourly rate of the individuals performing the sourcing activity and the amount of time they spend or will spend doing it will need to be known.

*Step 4.* Gather data and quantify costs. This is the most difficult and time-consuming step. In this step gather data for each of the metrics identified in Step 3 and quantify the respective costs. This requires information from various sources including interviews, surveys, the A/P system, and other internal databases. If information from internal databases is used, make sure to validate the numbers. Input errors can sometimes cause the numbers generated by these databases to be significantly inaccurate.

*Step 5.* Develop a cost timeline. Construct a cost timeline for the length of the life cycle. Place each cost element quantified in Step 4 in the appropriate time period. Then calculate totals for each time period as shown in the example.

*Step 6.* Bring costs to present value. Computing the present value allows decisions to be made based on present dollars. This is important because a dollar spent one year from now is not worth the same as a dollar spent now. The value of money spent anytime in the future will depend on the organization's cost of capital. To calculate the present value, therefore, obtain the organization's cost of capital from its finance department. Then calculate the present value of each total in the cost time line by using a present value table or a financial calculator. The sum of present values for each time period represents the total cost of ownership.

## The Importance of Opportunity Costs

When considering usage costs, make sure to identify opportunity costs, if any. An **opportunity cost** is defined as the cost of the next best alternative. Typical opportunity costs include lost sales, lost productivity, and downtime. The absence of these costs in an analysis could lead to an entirely different decision and, possibly, a wrong one, as illustrated below.

A supply manager looking to purchase a machine was evaluating two alternatives. Alternative A was priced at $100,000, and B was priced at $125,000. The delivery lead time for Machine A was 90 days, and Machine B was 30 days. When determining usage costs for A it was important to add the lost revenue that would have been generated during the 60 days (90 − 30 = 60) had machine B been installed. By including the cost of lost revenue, B became the better alternative even though it was priced higher.

In another case, a supply manager made the decision, based primarily on price, to purchase Machine Y instead of Machine X. His analysis, however, omitted the opportunity cost from the difference in production capacity between the two machines. Machine X was capable of producing 10% more units than Machine Y. In a market

## Sourcing Snapshot

## *Maytag Sources Globally to Compete*

Maytag dishwashers have Chinese motors and Mexican wiring, and are put together in a sprawling American factory in Jackson, Tennessee. Some refer to this three-tiered approach to manufacturing as a triad strategy. Maytag calls it trying to keep ahead of imports. For a long time, bulky appliances like washing machines and refrigerators largely were insulated from competition with cheap imports because of their cavernous size. "Big boxes of air are expensive to ship across the ocean," says Maytag Corp.'s Jim Starkweather.

Over time, though, sharply lower labor and production costs in Asia have offset high freight costs, enabling some imported appliances (such as China's Haier and Korea's LG Electronics) to be sold in the United States at lower prices. With the arrival of low-priced imports, Maytag had to radically rethink how and where it builds refrigerators, washing machines, and dishwashers; it found the triad strategy works best for now. "It's a logical progression for us," says Art Learmonth, senior vice president of supply chain, noting that Maytag wants to avoid a wholesale shift of production out of the United States. The company says it wants to stay as close as possible to its end market and avoid shedding American jobs wherever possible.

In the case of dishwashers, Maytag buys motors in China—from a plant owned by GE—because the design is standardized and stable and China offers the lowest price. Maytag makes wire harnesses for dishwashers in Mexico because those harnesses tend to be different in each dishwasher model, so sudden shifts in demand could make it difficult to supply from farther away. How was this decision made? By "dissecting" competitors' appliances to determine the cost of every component. Whenever a competitor introduces a new dishwasher, for example, Maytag buys one and brings it to Jackson to dismantle it. Engineers examine rival appliances' O-rings, steel tubes, and other elements and estimate what it costs to make the appliance in the United States—and what it would cost to make it in Mexico.

Not everything goes away permanently, though. Subassembly work for dishwashers, essentially putting pumps and motors together in one piece with cables and connectors, was done in Reynosa, Mexico, and shipped to Tennessee. But eventually it grew more cost-effective to do the work in Tennessee: A simpler design was introduced, reducing labor, and it used less-expensive motors from China rather than Mexico. Still, Maytag says it wouldn't build certain items in China. Maytag teamed with a German supplier to develop a "turbidity sensor" that scans water coming out of a dishwasher to determine how clean the dishes are. As long as it detects the tiniest bit of food, the dishes are deemed dirty and the machine keeps churning. Learmonth says the company wouldn't try to have the sensors built in China, because the Chinese "aren't as protective of new technology" and so such proprietary technology is at greater risk of being stolen.

In some cases, though, Maytag decides it simply can't compete with imports. For example, profit margins on refrigerators with the freezer on top, rather than alongside or on the bottom, were so measly due to cheap imports that Maytag decided to quit making them. Instead, it pays Daewoo Electronics in Korea to produce those models and ship them to the United States to be sold under the Maytag name.

Source: T. Aeppel, "Three Countries, One Dishwasher," *Wall Street Journal,* October 6, 2003, p. B1.

upswing, sales potential increased by 10%. Machine Y was unable to handle the increase and a new machine had to be purchased. Had the supply manager selected Machine X, the purchase of a new machine could have been deferred, thereby saving hundreds of thousands of dollars. Mistakes like this can easily be avoided by ensuring that all costs, especially opportunity costs, are captured in the TCO.

## Important Factors to Consider When Building a TCO Model

- Building a TCO can be a costly and time-intensive activity. Use it for evaluating larger purchases.
- Make sure to obtain senior management buy-in before embarking on a full-fledged TCO. It will make data gathering much easier, especially if several people from different parts of the organization have to be interviewed.
- Work in a team. This will greatly reduce the time required for data collection activities, which can be distributed among team members.
- Focus on the big costs first. Spending extended periods of time quantifying small cost elements will only delay the decision, which in most cases will not be impacted by them.
- Make sure to obtain a realistic estimate of the life cycle. A life cycle that is too short or too long could result in a wrong decision.
- Whether evaluating a purchase option or making an outsourcing decision, a TCO model will ensure that the right decision is made, at least from a cost perspective.

**Exhibit 11.13** TCO Calculation for One Purchase Option

| COST ELEMENTS | COST MEASURES |
|---|---|
| **Purchase Price (Step 1):** | |
| • Equipment (Step 2) | Supplier quote: $1,200 per PC (Steps 3 and 4) |
| • Software License A | Supplier quote: $300 per PC |
| • Software License B | Supplier quote: $100 per PC |
| • Software License C | Supplier quote: $50 per PC |
| **Acquisition Cost:** | |
| • Sourcing | 2 FTE @ $85K and $170K for 2 months |
| • Administration | 1 PO @ $150, 12 invoices @ $40 each |
| **Usage Costs:** | |
| • Installation | $700 per PC (PC move, install, network) |
| • Equipment Support | $120 per month per PC—supplier quote |
| • Network Support | $100 per month—supplier quote |
| • Warranty | $120 per PC for a 3-year warranty |
| • Opportunity Cost—Lost Productivity | Downtime 15 hours per PC per year @ $30 per hour |
| **End of Life:** | |
| • Salvage Value | $36 per PC |

**Exhibit 11.14** Total Cost of Ownership Calculation

| COST ELEMENTS | PRESENT | YEAR 1 (STEP 5) | YEAR 2 | YEAR 3 |
|---|---|---|---|---|
| **Purchase Price:** | | | | |
| Equipment | $1,200,000 | | | |
| Software License A | $ 300,000 | | | |
| Software License B | $ 100,000 | | | |
| Software License C | $ 50,000 | | | |
| **Acquisition Cost:** | | | | |
| Sourcing | $ 42,500 | | | |
| Administration | $ 150 | $ 480 | $ 480 | $ 480 |
| **Usage Costs:** | | | | |
| Opportunity Cost—Lost Productivity | | $ 450,000 | $ 450,000 | $ 450,000 |
| Installation | $ 700,000 | | | |
| Equipment Support | | $1,440,000 | $1,440,000 | $1,440,000 |
| Network Support | | $1,200,000 | $1,200,000 | $1,200,000 |
| Warranty | $ 120,000 | | | |
| **End of Life Costs:** | | | | |
| Salvage Value | | | | ($36,000) |
| **TOTAL** | $2,512,650 | $3,090,480 | $3,090,480 | $3,054,480 |
| Present Values @ 12% | $2,512,650 | $2,759,799 | $2,463,113 (Step 6) | $2,174,790 |

- When considering global sourcing, consider all of the relevant labor, quality, logistics, and import costs associated with the total supply chain. A good example of this model in action is shown in Sourcing Snapshot: Maytag Sources Globally to Compete.

## Example of a TCO Model

Supply manager Joe Smith was considering the purchase of 1,000 desktop PCs for his organization. The life cycle was 3 years and the organization's cost of capital was 12%. He calculated the TCO for one of the purchase options as shown in Exhibit 11.13 on p. 411.

Using these elements, the total cost of ownership for each of these decisions was calculated as shown in Exhibit 11.14.

On the basis of this model, the supply manager should explore the possibilities of reducing service costs such as equipment support and network support—these appear to be the highest value, and contribute most to costs. This is also typically the most profitable area for the supplier, as services are often not audited.

# Collaborative Approaches to Cost Management

Progressive purchasing departments across multiple industries such as automotive, electronics, and pharmaceutical have learned the hard way that the most effective way to reduce costs for strategic commodities is not through price haggling, but

through effective collaboration. When supply management, engineering, and suppliers put their heads together to find innovative ways to reduce costs, the outcome is generally mutually beneficial for both parties: The buying company gets a lower price, and in many cases, the supplier benefits from a higher margin and a guarantee of future business. Two of the most common approaches to collaborative cost management include target pricing and cost-savings sharing.

## Target Pricing Defined

Target pricing is an innovative approach used in the initial stages of the new-product development (NPD) cycle to establish a contract price between a buyer and seller. Japanese manufacturers, in an effort to motivate engineers to select designs that could be produced at a low cost, originally developed target pricing methodologies during the 1980s to battle the rising yen versus the U.S. dollar. These innovators came up with a simple concept to apply in new-product development: The cost of a new product is no longer an outcome of the product design process; rather, it is an input to the process. The challenge is to design a product with the required functionality and quality at a cost that provides a reasonable profit. In a new car, for example, the development team may work with marketing to determine the target price of the vehicle for the product's market segment. Using final price as a basis, the product is disaggregated into major systems, such as the engine and powertrain. Each major system has a target cost. At the component level (which represents a further disaggregation from the system level), the target cost is the price that a purchaser hopes to attain from a supplier (if the item is externally sourced).

With target pricing, a product's allowable cost is strictly a function of what a market segment is willing to pay less the profit goals for the product. Under traditional pricing approaches, however, product cost + profit = selling price. Using a target pricing approach, the selling price − profit = the allowable product cost. Generally speaking, the target cost is not always achievable by the supplier in early negotiations. Moreover, the supplier's current price to provide a product or service today is probably greater than the target price set forth by the buying company.

The difference between the supplier's price and the target cost becomes the strategic cost-reduction objective. This gap must be reduced by both parties in a collaborative effort through such methods as value engineering, quality function deployment, design for manufacturing/assembly, and standardization. Setting product-level target costs that are too aggressive may result in unachievable target costs. Setting too low a strategic cost-reduction challenge leads to easily achieved target costs but a loss of competitive position. In setting target prices and target costs, the new-product development team should bear in mind the cardinal rule of target costing: The target cost can never be violated. Moreover, even if engineers find a way to improve the functionality of the product, they cannot make the improvement unless they can offset the additional cost.

One of the pioneers and industry leaders in target pricing is Honda of America Manufacturing. The company breaks product costs down to the component level. Suppliers are asked to provide a detailed breakdown of their costs, including raw materials, labor, tooling, and required packaging as well as delivery, administrative, and other expenses. The breakdown of costs is helpful in suggesting ways that suppliers can seek to improve and thereby reduce costs. Cost tables are jointly developed with suppliers and used to find differences (line by line) across all elements of cost. A potential area of disagreement involves the supplier's profits and overhead. A fair profit is required but may be dependent on the level of investment. No fixed profit level is

used in negotiations. Purchasing must then aggregate the parts costs and compare them with the target costs. If total costs exceed target costs, the design must change or costs must be reduced. Although the supplier's profit margins might be an easy place to look for cost savings, Honda realizes that doing so would squander the trust it worked hard to develop with suppliers.[8]

Once a purchaser has established a target price with a supplier for the first year of a contract, additional cost reductions over the life of the product can be made through an ongoing effort to drive down costs year over year. This can be achieved through a technique known as cost-savings sharing.

## Cost-Savings Sharing Pricing Defined

Cost-savings sharing differs from traditional market-based pricing in several ways. First, cost-sharing approaches require joint identification of the full cost to produce an item, which is not the case with market-based pricing (where the buyer has little or no knowledge of the supplier's costs). Second, profit is a function of the productive investment committed to the purchased item and a supplier's asset return requirements (i.e., return on investment). Profit is not a direct function of cost (which is usually the practice with market-driven prices). The cost-based approach provides a supplier with incentives to pursue continuous performance improvement to realize shared cost savings and invest in productive assets. A later example illustrates these concepts.

An important feature of cost-savings sharing is the financial incentives offered to a seller for performance improvements above and beyond the improvements agreed to in the purchase contract. This differs from the traditional market-based pricing approach where one party (usually the purchaser) seeks to capture all cost savings resulting from a supplier's improvement effort. Traditional pricing practices have been a deterrent to cooperative efforts to make design, product, and process improvements. A cost-savings sharing approach recognizes the need to provide financial incentives to a supplier while enhancing closer relationships.

## Prerequisites for Successful Target and Cost-Based Pricing

In order for target and cost-based pricing to occur, there must be joint agreement on a supplier's full cost to produce an item. Identification of all costs provides the basis for establishing joint improvement targets. The total cost to produce an item includes labor; materials; other direct costs; any costs due to start-up and production; and administrative, selling, and other related expenses.

Besides total cost components, the parties must jointly identify and agree upon product volumes, target product costs at various points in time, and quantifiable productivity and quality improvement projections. Each firm must also agree on the asset base and return requirement at the supplier that determines an item's profit.

There must also be agreement on the point in time when mutual sharing of cost savings takes place, as well as the formula used to share the rewards. Mutual sharing of rewards usually occurs for savings above and beyond the performance improvement targets agreed to in the purchase contract, and savings on any items incidental to joint performance improvement targets.

This approach requires a high degree of trust, information sharing, and joint problem solving. This process will fail if one firm takes advantage of the other or violates

confidentiality of information sharing. There must also be a willingness to provide the resources necessary to resolve problems affecting overall success.

The ability to manage the risks associated with target pricing is another key prerequisite. Perhaps the main risk concerns volume variability. Because volume affects cost levels, both parties must carefully consider and manage the impact of changes from planned volume projections. Higher-than-projected volumes will result in a supplier achieving greater economies and lower per-unit costs. These lower costs, however, are not the result of a supplier's performance improvement. Conversely, lower-than-projected volumes may raise a supplier's average costs. Contractually, the parties must determine how to manage changes from the buying plan.

## When to Use Collaborative Cost Management Approaches

A cost-based approach to determining price is clearly not appropriate for all purchased items. Many items do not warrant cost analysis, or the marketplace determines price. Based on the cost management portfolio matrix discussed earlier in the chapter, it is obvious that products that are readily available from multiple sources, standardized instead of customized, and heavily influenced by the market forces of supply and demand do not fit the profile of items appropriate for cost-based pricing.

What types of items are feasible for a cost-based cooperative approach? A cost-based approach is feasible when the seller contributes high added value to an item through direct or indirect labor and specialized expertise. This approach is particularly appropriate for complex items customized to specific requirements. Also, products requiring a conversion from raw material through value-added designs at a supplier are possible candidates. Examples of such items include a specially designed

**Exhibit 11.15** Key Data for the Cost-Based Pricing Example

**First-Year Target Price: $61.00**

**Negotiated/Analyzed Cost Structure**

| | |
|---|---|
| Material | $20 per unit |
| Labor rate | $8.50 per unit |
| Burden rate* | 200% of direct labor |
| Scrap rate | 10% |
| Selling, general, and administrative expense rate | 10% of manufacturing cost |
| Effective volume range | 125,000 units per year ± 10% |
| Projected product life | 2 years |
| Return on investment agreed to | 30% |

| | YEAR 1 | YEAR 2 |
|---|---|---|
| Supplier investment | $3 million | $2 million |
| Total supplier investment | $5 million | |
| Supplier improvement commitment | | |
| Direct labor | 10% reduction annually | |
| Scrap rate | 50% reduction annually | |

Improvements incidental to agreed-upon performance improvements: Shared 50/50

* "Burden" is a term used in accounting to describe costs of manufacture or production not directly identifiable with an exact product or unit of production. They are indirect or apportionable costs.

antilock brake system or a dashboard for an automobile. These items require a high value-added conversion from raw materials into a semifinished product. The supplier also likely contributes design and engineering support.

## An Example of Target Pricing and Cost-Savings Sharing

Although actual target and cost-savings sharing agreements can be lengthy and complex, the following example demonstrates the fundamental principles of this strategic cost management approach. This example is based on an actual situation that occurred between an automotive OEM and a first-tier supplier.

A purchaser seeks to purchase a designed component that is part of a final end product. The final selling price of the product has been determined through discussions with marketing, and this figure has been rolled down (or disaggregated) to the component level. As such, both parties have agreed to target a purchase (or selling) price of $61 for the component for the first year. The purchaser has targeted this price as one that will support meeting the overall target price of the final end product.

Cost-savings sharing assumes that the buyer and seller will collaborate to identify the most efficient processes to produce a product as the basis for the cost structure. This approach does not reward inefficient processes or practices, and also assumes that engineers at the buying organization are flexible and willing to modify product specifications to align with the supplier's processes. Throughout this example the supplier's costs and return requirements serve as the basis for determining a fair and competitive price. Both parties agree to a negotiated cost-based approach because the parties have developed a close working relationship, supporting the sharing of detailed cost data, and because the supplier's cost structure is relatively efficient.

Exhibit 11.15 on p. 415 details the costs and investment data needed to develop a cost-based purchase contract.

Both firms must identify the costs and supplier investment associated with the purchased component, identify and agree on the supplier's asset return requirements, and identify supplier commitments to annual performance improvement targets.

These exhibits provide the basis for evaluating cost and price throughout the life of the contract.

Exhibit 11.16 details the cost breakdown and subsequent price of the component for each year of this contract. Data for year 1 include the negotiated/analyzed information presented in Exhibit 11.15. During the first year, the following events affected the selling price at the start of year 2:

- Overall material costs rise by 4% due to raw material cost increases.
- A joint value analysis team identifies a substitute material that reduces material costs by $1.50 per unit.
- Labor rates increase by 3% per unit due to a scheduled contractual increase at the supplier.
- The supplier meets the agreed productivity improvement targets for reduced scrap and improved labor productivity.

Year 2 data include these events.

- The supplier receives 50% of the $1.50 material reduction identified by the value analysis team.

**Exhibit 11.16** Cost and Profit Breakdown for the Cost-Based Pricing Example

| | YEAR 1 | YEAR 2 | |
|---|---|---|---|
| Materials | $20.00 | $19.24 | Materials reduction of $1.50 plus an overall materials increase of 4% (($20.00 – $1.50) × 1.04) |
| Labor | 8.50 | 7.88 | Reduction of 10% – Contractual target improvement plus 3% increase ($8.50 × .9 × 1.03) |
| Burden (200% × labor) | 17.00 | 15.76 | |
| Total materials, labor, burden | $45.50 | $42.88 | |
| Scrap (10%) | 4.55 | 2.14 | Scrap reduced from 10% to 5% – Contractual target ($42.88 × .05) |
| Manufacturing cost | $50.05 | 45.02 | |
| Selling and administrative expenses (10%) | 5.00 | 4.50 | |
| Total cost | $55.05 | $49.52 | |
| Profit* | 6.00 | 6.75 | Includes $.75 share for joint material reduction ($6 + ($1.50/2)) |
| Selling price | $61.50 | $56.27 | New selling price after year 1 events |

*Profit is based on the 30% return on the investment figure agreed to between buyer and seller.
Profit = ($5 million total two-year investment × .3)/250,000 total units
= $6.00 profit per unit

- The profit figure for year 2 includes the supplier's share of the material reduction.
- The selling price at the start of year 2 becomes $56.27.

By focusing on joint and continuous performance improvement, the purchase price was reduced at a time when material and labor costs actually increased. This example illustrates the potential for improvement that can occur through joint price/cost analysis.

Establishing agreement on cost and price early in design and development supports the reduction of material costs through cooperative efforts. The use of cost-savings sharing can induce both parties to work together to achieve mutual goals. The purchaser reduces its cost curve for purchased items and also establishes a basis for continuous cost-improvement initiatives. The supplier benefits from longer-term contracts, a fair profit based on its asset investment, and increased competitiveness due to improvements occurring because of the purchaser's insights and contributions.

## Good Practice Example

### *A Computer Manufacturer Brings in the Voice of the Customer and the Voice of the Factory*

Best-in-class companies recognize that cost is designed into the product from the outset, especially the total cost of managing the product over its life cycle. This was an important component for a best-in-class product design at a large computer manufacturer, which recognized the significance of order fulfillment impact as an explicit outcome of the product design decision. This meant developing a process for product design decisions that implicitly

involved the voice of the factory (VOF) and the voice of the supplier in product design decisions:

> We were involved in the negotiation of features that marketing wanted. Most of the requests they wanted had to be justified and brought in front of the team. The Voice of the Factory rep typically fought against any decisions that would add complexity to the producibility of the product from an order fulfillment perspective. The VOF team design was an upper management decision that drove this individual into the team structure. However, the specific ways that people went about communicating would typically vary by product and by team. It was, however, part of the mission statement of each NPD team.
>
> Most of the people on the VOF team had physically been to a factory in order to understand what people in the factories were facing day to day, especially in preproduction factory build tests. The factory would tell the VOF reps what the problems encountered in assembly were, and request that these issues be brought forward to the design team. The VOF teams were therefore able to put forth educated arguments to the NPD team. VOF teams also had weekly conference calls to update status and identify issue closure, and were tied to the NPD team from start to finish.

The teams emphasized the need for meaningful involvement of different business functions in the idea generation phase, but also noted that this was a rarity, not a common occurrence in their organizations. A target cost process was established early on to provide targets for the various groups on achieving the target cost for a unit. It quickly aligned marketing and design with supply chain team members on how to achieve those costs at the component and manufacturing level. On the component side the key driver was target cost—and responsibility was placed on all the groups that brought in that part or component. The four major groups (R&D, marketing, operations, and supply) agreed to the final target price. R&D looked at it from a best-case theoretical perspective, and some engineering teams did value engineering to come up with a projected target cost. Supply chain, dealing with the real world, would assess who could do it out there—and how close they could come to target price—based on the size of the product and the part of the country (labor rates).

> Platform manufacturing capability and equipment was brought into the NPD process—and we saved a lot. Proliferation of part numbers was an issue—so we required people to carry over old parts into new products on amortized tooling, which prevented proliferation of part numbers with minor changes made only because engineers would design from the ground up. There were design guidelines and rules calling for 40% carryover for new product. Then R&D and engineering and SCM would get together to decide on which ones would be carried over. First R&D would make recommendations, and then procurement would check to see if tooling and equipment could sustain another four years of production, and what the investment would be.

The importance of establishing impact on customer needs, while weighing the feasibility of introducing new technologies and parts, must be explicitly considered. For example, the manufacturer noted the following:

> If there were specific marketing features that were put forward to an individual team, the decision went one of two ways. If a senior vice president insisted that the product had to have this feature, no one would say no, even if

> the core team did not like it. On the other hand, if marketing put forward a feature such as an additional keyboard option, the representative had to put together a business case, which identified how many extra will be sold, the incremental margin derived, and so on.

This same individual also emphasized that procurement could be playing a more significant role in defining the technology roadmap for the product through its supply market intelligence and knowledge of supplier roadmaps and evolving technologies:

> There is a real missed opportunity by not having the core NPD team involved in the roadmap, which is published two years prior to roll-out. The upper management team makes changes or additions at that level, and there is typically no time to provide input into that process. The NPD VOF and procurement reps could better plan for capacity and align supplier planning processes earlier to better prepare. Typically, however, the team will wait until the product is kicked off before putting together the core team, as some products are killed, and people do not want to put in effort on a product that is not definitely going to go into the pipeline.

## Questions

1. What are the typical arguments put forth by marketing for increasing complexity of a product line by adding additional features and options?
2. What are the typical arguments put forward by the supply chain and the Voice of the Factory operations leader in simplifying the product line?
3. Discuss the key elements that are required to build a decision support tool to create a business case to resolve this issue. Where would the data for building this decision support tool come from?

Source: R. Handfield, C. Bozarth, J. McCreery, and S. Edwards, "Design for Order Fulfillment Best Practices," white paper, Supply Chain Resource Cooperative, July 2007.

## CONCLUSION

An awareness of cost fundamentals, cost analysis techniques, and innovative approaches to product costing is simply another area for the purchasing and supply chain professional to master. Buyers and supply chain specialists involved with nonstandard, technically complex items must have the ability to evaluate a supplier's cost structure and match supplier capabilities and product requirements from a cost perspective.

The ability to practice price and cost analysis techniques, such as those outlined in this chapter, can make the difference between creating value and creating waste.

## KEY TERMS

**cost analysis,** 384
**opportunity cost,** 409
**price analysis,** 384
**total cost analysis,** 384
**total cost of ownership,** 408

## DISCUSSION QUESTIONS

1. Why should a purchaser evaluate the cost of making an item instead of simply evaluating the purchase price? Is this true for all types of products? Why or why not?
2. List some of the reasons suppliers are reluctant to share detailed cost information. What can purchasers do to convince suppliers that shared cost data will not be exploited?
3. Is global sourcing always the lowest-cost option on account of the low labor rates? What other types of data have to go into this decision?
4. What is the difference between a fixed cost, a semivariable cost, and a variable cost?
5. Discuss the different pricing strategies a seller can use along with the key features of each. Provide examples of current marketplaces where these types of pricing arrangements are shifting dramatically.
6. Can you provide examples of suppliers or industries that are currently utilizing a price volume model, market share model, competition pricing model, and revenue pricing model?
7. What types of cost information are available on the Internet? What types of price information are available on the Internet? Is this information reliable?
8. Under what conditions does a buyer have the most purchasing leverage over a seller?
9. When does a seller have the most leverage over a buyer?
10. What is the total cost of ownership concept? What are some of the challenges that must be overcome when implementing a total cost measurement system?
11. What are the benefits from measuring the total cost of ownership for a purchased item? Are there any potential disadvantages of this approach? If so, what are they?
12. How is the price of an item established in a target pricing contract? What makes target pricing attractive to a buyer and seller?

13. Can a company use a target pricing model without a follow-on cost-savings sharing agreement? Why or why not?
14. If a buyer and seller do not have a close working relationship, how can a buyer obtain cost data to perform a cost analysis for a supplier before awarding a purchase contract?
15. What happens if a supplier cannot meet a purchaser's initial target price? How is this issue resolved?

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## ENDNOTES

1. Personal interview by Robert Handfield with John Calabrese, vice president of advanced purchasing, General Motors, August 16, 2000.
2. Based on Bendorf, R. (2002), "Supplier Pricing Models," *Inside Supply Management,* May, pp. 18–19.
3. Tubb, R. (2007), "The Nation's Changing Landscape," *Pipeline and Gas Journal,* March.
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7. This section is based on Menezes, S. (2001), *Purchasing Today,* January, pp. 28–32.

8. Adapted from Krause, D., and Handfield, R. (1999), *Developing a World Class Supply Base,* Tempe, AZ: Center for Advanced Purchasing Studies.