

► Learning Objectives

1. Recognize which of two generic strategies a company is using
2. Understand what comprises reengineering
3. Understand the four perspectives of the balanced scorecard
4. Analyze changes in operating income to evaluate strategy
5. Identify unused capacity and how to manage it

Olive Garden wants to know.

So do Barnes and Noble, PepsiCo, and L.L.Bean. Even your local car dealer and transit authority are curious. They all want to know how well they are doing and how they score against the measures they strive to meet. The balanced scorecard can help them answer this question by evaluating key performance measures. Many companies have successfully used the balanced scorecard approach. Infosys Technologies, one of India's leading information technology companies, is one of them.

Balanced Scorecard Helps Infosys Transform into a Leading Consultancy¹

In the early 2000s, Infosys Technologies was a company in transition. The Bangalore-based company was a market leader in information technology outsourcing, but needed to expand to meet increased client demand. Infosys invested in many new areas including business process outsourcing, project management, and management consulting. This put Infosys in direct competition with established consulting firms, such as IBM and Accenture.

Led by CEO Kris Gopalakrishnan, the company developed an integrated management structure that would help align these new, diverse initiatives. Infosys turned to the balanced scorecard to provide a framework the company could use to formulate and monitor its strategy. The balanced scorecard measures corporate performance along four dimensions—financial, customer, internal business process, and learning and growth.

The balanced scorecard immediately played a role in the transformation of Infosys. The executive team used the scorecard to guide discussion during its meetings. The continual process of adaptation, execution, and management that the scorecard fostered helped the team respond to, and even anticipate, its clients' evolving needs. Eventually, use of the scorecard for performance measurement spread to the rest of the organization, with monetary incentives linked to the company's performance along the different dimensions.

Over time, the balanced scorecard became part of the Infosys culture. In recent years, Infosys has begun using the balanced

¹ Source: Asis Martinez-Jerez, F, Robert S. Kaplan, and Katherine Miller. 2011. Infosys's relationship scorecard: Measuring transformational partnerships. Harvard Business School Case No. 9-109-006. Boston: Harvard Business School Publishing.

scorecard concept to create “relationship scorecards” for many of its largest clients. Using the scorecard framework, Infosys began measuring its performance for key clients not only on project management and client satisfaction, but also on repeat business and anticipating clients’ future strategic needs.

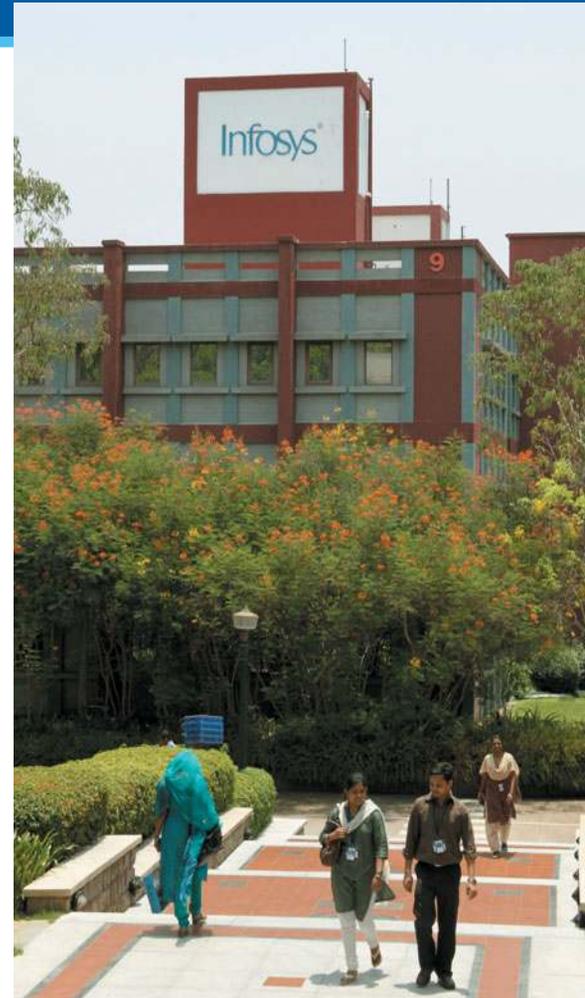
The balanced scorecard helped successfully steer the transformation of Infosys from a technology outsourcer to a leading business consultancy. From 1999 to 2007, the company had a compound annual growth rate of 50%, with sales growing from \$120 million in 1999 to more than \$3 billion in 2007. Infosys was recognized for its achievements by making the *Wired* 40, *BusinessWeek* IT 100, and *BusinessWeek* Most Innovative Companies lists.

This chapter focuses on how management accounting information helps companies such as Infosys, Merck, Verizon, and Volkswagen implement and evaluate their strategies. Strategy drives the operations of a company and guides managers’ short-run and long-run decisions. We describe the balanced scorecard approach to implementing strategy and methods to analyze operating income to evaluate the success of a strategy. We also show how management accounting information helps strategic initiatives, such as productivity improvement, reengineering, and downsizing.

What Is Strategy?

Strategy specifies how an organization matches its own capabilities with the opportunities in the marketplace to accomplish its objectives. In other words, strategy describes how an organization can create value for its customers while differentiating itself from its competitors. For example, Wal-Mart, the retail giant, creates value for its customers by locating stores in suburban and rural areas, and by offering low prices, a wide range of product categories, and few choices within each product category. Consistent with its strategy, Wal-Mart has developed the capability to keep costs down by aggressively negotiating low prices with its suppliers in exchange for high volumes and by maintaining a no-frills, cost-conscious environment.

In formulating its strategy, an organization must first thoroughly understand its industry. Industry analysis focuses on five forces: (1) competitors, (2) potential entrants into the market, (3) equivalent products, (4) bargaining power of customers, and (5) bargaining power of input suppliers.² The collective effect of these forces shapes an organization’s profit potential. In general, profit potential decreases with greater competition, stronger potential entrants, products that are similar, and more-demanding customers and suppliers. We illustrate these five forces for Chipset, Inc., maker of linear integrated circuit



Learning Objective 1

Recognize which of two generic strategies a company is using

... product differentiation or cost leadership

² M. Porter, *Competitive Strategy* (New York: Free Press, 1980); M. Porter, *Competitive Advantage* (New York: Free Press, 1985); and M. Porter, “What Is Strategy?” *Harvard Business Review* (November–December 1996): 61–78.

devices (LICDs) used in modems and communication networks. Chipset produces a single specialized product, CX1, a standard, high-performance microchip, which can be used in multiple applications. Chipset designed CX1 with extensive input from customers.

1. **Competitors.** The CX1 model faces severe competition with respect to price, timely delivery, and quality. Companies in the industry have high fixed costs, and persistent pressures to reduce selling prices and utilize capacity fully. Price reductions spur growth because it makes LICDs a cost-effective option in new applications such as digital subscriber lines (DSLs).
2. **Potential entrants into the market.** The small profit margins and high capital costs discourage new entrants. Moreover, incumbent companies such as Chipset are further down the learning curve with respect to lowering costs and building close relationships with customers and suppliers.
3. **Equivalent products.** Chipset tailors CX1 to customer needs and lowers prices by continuously improving CX1's design and processes to reduce production costs. This reduces the risk of equivalent products or new technologies replacing CX1.
4. **Bargaining power of customers.** Customers, such as EarthLink and Verizon, negotiate aggressively with Chipset and its competitors to keep prices down because they buy large quantities of product.
5. **Bargaining power of input suppliers.** To produce CX1, Chipset requires high-quality materials (such as silicon wafers, pins for connectivity, and plastic or ceramic packaging) and skilled engineers, technicians, and manufacturing labor. The skill-sets suppliers and employees bring gives them bargaining power to demand higher prices and wages.

In summary, strong competition and the bargaining powers of customers and suppliers put significant pressure on Chipset's selling prices. To respond to these challenges, Chipset must choose one of two basic strategies: *differentiating its product* or *achieving cost leadership*.

Product differentiation is an organization's ability to offer products or services perceived by its customers to be superior and unique relative to the products or services of its competitors. Apple Inc. has successfully differentiated its products in the consumer electronics industry, as have Johnson & Johnson in the pharmaceutical industry and Coca-Cola in the soft drink industry. These companies have achieved differentiation through innovative product R&D, careful development and promotion of their brands, and the rapid push of products to market. Differentiation increases brand loyalty and the willingness of customers to pay higher prices.

Cost leadership is an organization's ability to achieve lower costs relative to competitors through productivity and efficiency improvements, elimination of waste, and tight cost control. Cost leaders in their respective industries include Wal-Mart (consumer retailing), Home Depot and Lowe's (building products), Texas Instruments (consumer electronics), and Emerson Electric (electric motors). These companies provide products and services that are similar to—not differentiated from—their competitors, but at a lower cost to the customer. Lower selling prices, rather than unique products or services, provide a competitive advantage for these cost leaders.

What strategy should Chipset follow? To help it decide, Chipset develops the customer preference map shown in Exhibit 13-1. The *y*-axis describes various attributes of the product desired by customers. The *x*-axis describes how well Chipset and Visilog, a competitor of Chipset that follows a product-differentiation strategy, do along the various attributes desired by customers from 1 (poor) to 5 (very good). The map highlights the trade-offs in any strategy. It shows the advantages CX1 enjoys in terms of price, scalability (the CX1 technology allows Chipset's customer to achieve different performance levels by simply altering the number of CX1 units in their product), and customer service. Visilog's chips, however, are faster and more powerful, and are customized for various applications such as different types of modems and communication networks.

CX1 is somewhat differentiated from competing products. Differentiating CX1 further would be costly, but Chipset may be able to charge a higher price. Conversely, reducing the cost of manufacturing CX1 would allow Chipset to lower price, spur growth, and increase market share. The scalability of CX1 makes it an effective solution for meeting

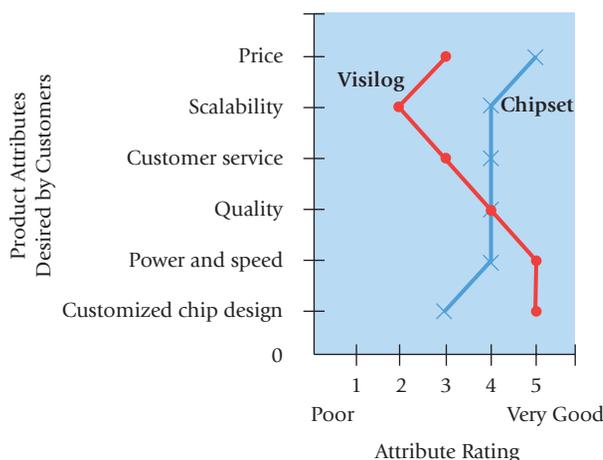


Exhibit 13-1

Customer Preference Map for LICDs

varying customer needs. Also, Chipset's current engineering staff is more skilled at making product and process improvements than at creatively designing new products and technologies. Chipset decides to follow a cost-leadership strategy.

To achieve its cost-leadership strategy, Chipset must improve its own internal capabilities. It must enhance quality and reengineer processes to downsize and eliminate excess capacity. At the same time, Chipset's management team does not want to make cuts in personnel that would hurt company morale and hinder future growth.

Building Internal Capabilities: Quality Improvement and Reengineering at Chipset

To improve product quality—that is, to reduce defect rates and improve yields in its manufacturing process—Chipset must maintain process parameters within tight ranges based on real-time data about manufacturing-process parameters, such as temperature and pressure. Chipset must also train its workers in quality-management techniques to help them identify the root causes of defects and ways to prevent them and empower them to take actions to improve quality.

A second element of Chipset's strategy is reengineering its order-delivery process. Some of Chipset's customers have complained about the lengthening time span between ordering products and receiving them. **Reengineering** is the fundamental rethinking and redesign of business processes to achieve improvements in critical measures of performance, such as cost, quality, service, speed, and customer satisfaction.³ To illustrate reengineering, consider the order-delivery system at Chipset in 2010. When Chipset received an order from a customer, a copy was sent to manufacturing, where a production scheduler began planning the manufacturing of the ordered products. Frequently, a considerable amount of time elapsed before production began on the ordered product. After manufacturing was complete, CX1 chips moved to the shipping department, which matched the quantities of CX1 to be shipped against customer orders. Often, completed CX1 chips stayed in inventory until a truck became available for shipment. If the quantity to be shipped was less than the number of chips requested by the customer, a special shipment was made for the balance of the chips. Shipping documents moved to the billing department for issuing invoices. Special staff in the accounting department followed up with customers for payments.

The many transfers of CX1 chips and information across departments (sales, manufacturing, shipping, billing, and accounting) to satisfy a customer's order created delays. Furthermore, no single individual was responsible for fulfilling a customer order. To respond to these challenges, Chipset formed a cross-functional team in late 2010 and implemented a reengineered order-delivery process in 2011.

³ See M. Hammer and J. Champy, *Reengineering the Corporation: A Manifesto for Business Revolution* (New York: Harper, 1993); E. Ruhli, C. Treichler, and S. Schmidt, "From Business Reengineering to Management Reengineering—A European Study," *Management International Review* (1995): 361–371; and K. Sandberg, "Reengineering Tries a Comeback—This Time for Growth, Not Just for Cost Savings," *Harvard Management Update* (November 2001).

Decision Point

What are two generic strategies a company can use?

Learning Objective 2

Understand what comprises reengineering

... redesigning business processes to improve performance by reducing cost and improving quality

Under the new system, a customer-relationship manager is responsible for each customer and negotiates long-term contracts specifying quantities and prices. The customer-relationship manager works closely with the customer and with manufacturing to specify delivery schedules for CX1 one month in advance of shipment. The schedule of customer orders and delivery dates is sent electronically to manufacturing. Completed chips are shipped directly from the manufacturing plant to customer sites. Each shipment automatically triggers an electronic invoice and customers electronically transfer funds to Chipset's bank.

Companies, such as AT&T, Banca di America e di Italia, Cigna Insurance, Cisco, PepsiCo, and Siemens Nixdorf, have realized significant benefits by reengineering their processes across design, production, and marketing (just as in the Chipset example). Reengineering has only limited benefits when reengineering efforts focus on only a single activity such as shipping or invoicing rather than the entire order-delivery process. To be successful, reengineering efforts must focus on changing roles and responsibilities, eliminating unnecessary activities and tasks, using information technology, and developing employee skills.

Take another look at Exhibit 13-1 and note the interrelatedness and consistency in Chipset's strategy. To help meet customer preferences for price, quality, and customer service, Chipset decides on a cost-leadership strategy. And to achieve cost leadership, Chipset builds internal capabilities by reengineering its processes. Chipset's next challenge is to effectively implement its strategy

Decision Point

What is reengineering?

Learning Objective 3

Understand the four perspectives of the balanced scorecard

. . . financial, customer, internal business process, and learning and growth

Strategy Implementation and the Balanced Scorecard

Many organizations, such as Allstate Insurance, Bank of Montreal, BP, and Dow Chemical, have introduced a *balanced scorecard* approach to track progress and manage the implementation of their strategies.

The Balanced Scorecard

The **balanced scorecard** translates an organization's mission and strategy into a set of performance measures that provides the framework for implementing its strategy.⁴ The balanced scorecard does not focus solely on achieving short-run financial objectives. It also highlights the nonfinancial objectives that an organization must achieve to meet and sustain its financial objectives. The scorecard measures an organization's performance from four perspectives: (1) financial, the profits and value created for shareholders; (2) customer, the success of the company in its target market; (3) internal business processes, the internal operations that create value for customers; and (4) learning and growth, the people and system capabilities that support operations. A company's strategy influences the measures it uses to track performance in each of these perspectives.

Why is this tool called a balanced scorecard? Because it balances the use of financial and nonfinancial performance measures to evaluate short-run and long-run performance in a single report. The balanced scorecard reduces managers' emphasis on short-run financial performance, such as quarterly earnings, because the key strategic nonfinancial and operational indicators, such as product quality and customer satisfaction, measure changes that a company is making for the long run. The financial benefits of these long-run changes may not show up immediately in short-run earnings; however, strong improvement in nonfinancial measures usually indicates the creation of future economic value. For example, an increase in customer satisfaction, as measured by customer surveys and repeat purchases, signals a strong likelihood of higher sales and income in the future. By balancing the mix of financial and nonfinancial measures, the balanced scorecard

⁴ See R. S. Kaplan and D. P. Norton, *The Balanced Scorecard* (Boston: Harvard Business School Press, 1996); R. S. Kaplan and D. P. Norton, *The Strategy-Focused Organization: How Balanced Scorecard Companies Thrive in the New Business Environment* (Boston: Harvard Business School Press, 2001); R. S. Kaplan and D. P. Norton, *Strategy Maps: Converting Intangible Assets into Tangible Outcomes* (Boston: Harvard Business School Press, 2004); and R. S. Kaplan and D. P. Norton, *Alignment: Using the Balanced Scorecard to Create Corporate Synergies* (Boston: Harvard Business School Press, 2006).

For simplicity, this chapter, and much of the literature, emphasizes long-run financial objectives as the primary goal of for-profit companies. For-profit companies interested in long-run financial, environmental, and social objectives adapt the balanced scorecard to implement all three objectives.

broadens management’s attention to short-run *and* long-run performance. *Never lose sight of the key point. In for-profit companies, the primary goal of the balanced scorecard is to sustain long-run financial performance. Nonfinancial measures simply serve as leading indicators for the hard-to-measure long-run financial performance.*

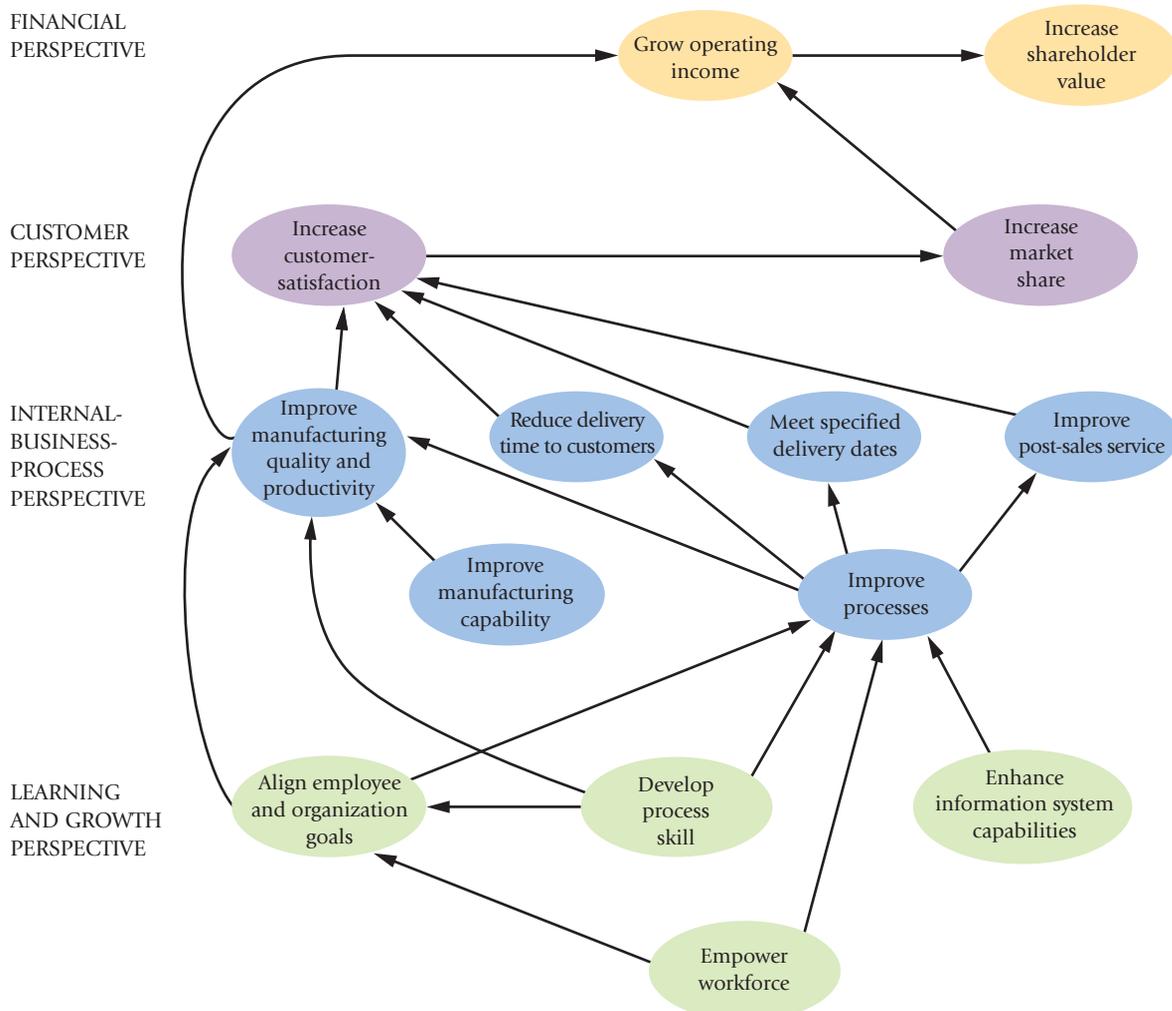
Strategy Maps and the Balanced Scorecard

We use the Chipset example to develop strategy maps and the four perspectives of the balanced scorecard. The objectives and measures Chipset’s managers choose for each perspective relates to the action plans for furthering Chipset’s cost leadership strategy: *improving quality and reengineering processes.*

Strategy Maps

A useful first step in designing a balanced scorecard is a *strategy map*. A **strategy map** is a diagram that describes how an organization creates value by connecting strategic objectives in explicit cause-and-effect relationships with each other in the financial, customer, internal business process, and learning and growth perspectives. Exhibit 13-2 presents Chipset’s strategy map. Follow the arrows to see how a strategic objective affects other strategic objectives. For example, empowering the workforce helps align employee and organization goals and improves processes. Employee and organizational alignment also helps improve processes that improve manufacturing quality and productivity, reduce customer delivery time, meet specified delivery dates, and improve post-sales service, all of which increase customer satisfaction. Improving manufacturing quality and productivity

Exhibit 13-2 Strategy Map for Chipset, Inc., for 2011



grows operating income and increases customer satisfaction that, in turn, increases market share, operating income, and shareholder value.

Chipset operates in a knowledge-intensive business. To compete successfully, Chipset invests in its employees, implements new technology and process controls, improves quality, and reengineers processes. Doing these activities well enables Chipset to build capabilities and intangible assets, which are not recorded as assets in its financial books. The strategy map helps Chipset evaluate whether these intangible assets are generating financial returns.

Chipset could include many other cause-and-effect relationships in the strategy map in Exhibit 13-2. But, Chipset, like other companies implementing the balanced scorecard, focuses on only those relationships that it believes to be the most significant.

Chipset uses the strategy map from Exhibit 13-2 to build the balanced scorecard presented in Exhibit 13-3. The scorecard highlights the four perspectives of performance: financial, customer, internal business process, and learning and growth. The first column presents the strategic objectives from the strategy map in Exhibit 13-2. At the beginning of 2011, the company's managers specify the strategic objectives, measures, initiatives (the actions necessary to achieve the objectives), and target performance (the first four columns of Exhibit 13-3).

Chipset wants to use the balanced scorecard targets to drive the organization to higher levels of performance. Managers therefore set targets at a level of performance that is achievable, yet distinctly better than competitors. Chipset's managers complete the fifth column, reporting actual performance at the end of 2011. This column compares Chipset's performance relative to target.

Four Perspectives of the Balanced Scorecard

We next describe the perspectives in general terms and illustrate each perspective using the measures chosen by Chipset in the context of its strategy.

1. **Financial perspective.** This perspective evaluates the profitability of the strategy and the creation of shareholder value. Because Chipset's key strategic initiatives are cost reduction relative to competitors' costs and sales growth, the financial perspective focuses on how much operating income results from reducing costs and selling more units of CX1.
2. **Customer perspective.** This perspective identifies targeted customer and market segments and measures the company's success in these segments. To monitor its customer objectives, Chipset uses measures such as market share in the communication-networks segment, number of new customers, and customer-satisfaction ratings.
3. **Internal-business-process perspective.** This perspective focuses on internal operations that create value for customers that, in turn, help achieve financial performance. Chipset determines internal-business-process improvement targets after benchmarking against its main competitors using information from published financial statements, prevailing prices, customers, suppliers, former employees, industry experts, and financial analysts. The internal-business-process perspective comprises three subprocesses:
 - **Innovation process:** Creating products, services, and processes that will meet the needs of customers. This is a very important process for companies that follow a product-differentiation strategy and must constantly design and develop innovative new products to remain competitive in the marketplace. Chipset's innovation focuses on improving its manufacturing capability and process controls to lower costs and improve quality. Chipset measures innovation by the number of improvements in manufacturing processes and percentage of processes with advanced controls.
 - **Operations process:** Producing and delivering existing products and services that will meet the needs of customers. Chipset's strategic initiatives are (a) improving manufacturing quality, (b) reducing delivery time to customers, and (c) meeting specified delivery dates so it measures yield, order-delivery time, and on-time deliveries.
 - **Postsales-service process:** Providing service and support to the customer after the sale of a product or service. Chipset monitors how quickly and accurately it is responding to customer-service requests.

Exhibit 13-3

The Balanced Scorecard for Chipset, Inc., for 2011

Strategic Objectives	Measures	Initiatives	Target Performance	Actual Performance
Financial Perspective				
Grow operating income	Operating income from productivity gain	Manage costs and unused capacity	\$1,850,000	\$1,912,500
Increase shareholder value	Operating income from growth	Build strong customer relationships	\$2,500,000	\$2,820,000
	Revenue growth		9%	10% ^a
Customer Perspective				
Increase market share	Market share in communication-networks segment	Identify future needs of customers	6%	7%
Increase customer satisfaction	Number of new customers	Identify new target-customer segments	1	1 ^b
	Customer-satisfaction ratings	Increase customer focus of sales organization	90% of customers give top two ratings	87% of customers give top two ratings
Internal-Business-Process Perspective				
Improve postsales service	Service response time	Improve customer-service process	Within 4 hours	Within 3 hours
Improve manufacturing quality and productivity	Yield	Identify root causes of problems and improve quality	78%	79.3%
Reduce delivery time to customers	Order-delivery time	Reengineer order-delivery process	30 days	30 days
Meet specified delivery dates	On-time delivery	Reengineer order-delivery process	92%	90%
Improve processes	Number of major improvements in manufacturing and business processes	Organize teams from manufacturing and sales to modify processes	5	5
Improve manufacturing capability	Percentage of processes with advanced controls	Organize R&D/manufacturing teams to implement advanced controls	75%	75%
Learning-and-Growth Perspective				
Align employee and organization goals	Employee-satisfaction ratings	Employee participation and suggestions program to build teamwork	80% of employees give top two ratings	88% of employees give top two ratings
Empower workforce	Percentage of line workers empowered to manage processes	Have supervisors act as coaches rather than decision makers	85%	90%
Develop process skill	Percentage of employees trained in process and quality management	Employee training programs	90%	92%
Enhance information-system capabilities	Percentage of manufacturing processes with real-time feedback	Improve online and offline data gathering	80%	80%

^a(Revenues in 2011 – Revenues in 2010) ÷ Revenues in 2010 = (\$25,300,000 – \$23,000,000) ÷ \$23,000,000 = 10%.

^bNumber of customers increased from seven to eight in 2011.

4. **Learning-and-growth perspective.** This perspective identifies the capabilities the organization must excel at to achieve superior internal processes that in turn create value for customers and shareholders. Chipset's learning and growth perspective emphasizes three capabilities: (1) information-system capabilities, measured by the percentage of manufacturing processes with real-time feedback; (2) employee capabilities, measured by the percentage of employees trained in process and quality management; and (3) motivation, measured by employee satisfaction and the percentage of manufacturing and sales employees (line employees) empowered to manage processes.

The arrows in Exhibit 13-3 indicate the *broad* cause-and-effect linkages: how gains in the learning-and-growth perspective lead to improvements in internal business processes, which lead to higher customer satisfaction and market share, and finally lead to superior financial performance. Note how the scorecard describes elements of Chipset's strategy implementation. Worker training and empowerment improve employee satisfaction and lead to manufacturing and business-process improvements that improve quality and reduce delivery time. The result is increased customer satisfaction and higher market share. These initiatives have been successful from a financial perspective. Chipset has earned significant operating income from its cost leadership strategy, and that strategy has also led to growth.

A major benefit of the balanced scorecard is that it promotes causal thinking. Think of the balanced scorecard as a *linked scorecard* or a *causal scorecard*. Managers must search for empirical evidence (rather than rely on faith alone) to test the validity and strength of the various connections. A causal scorecard enables a company to focus on the key drivers that steer the implementation of the strategy. Without convincing links, the scorecard loses much of its value.

Implementing a Balanced Scorecard

To successfully implement a balanced scorecard requires commitment and leadership from top management. At Chipset, the team building the balanced scorecard (headed by the vice president of strategic planning) conducted interviews with senior managers, probed executives about customers, competitors, and technological developments, and sought proposals for balanced scorecard objectives across the four perspectives. The team then met to discuss the responses and to build a prioritized list of objectives.

In a meeting with all senior managers, the team sought to achieve consensus on the scorecard objectives. Senior management was then divided into four groups, with each group responsible for one of the perspectives. In addition, each group broadened the base of inputs by including representatives from the next-lower levels of management and key functional managers. The groups identified measures for each objective and the sources of information for each measure. The groups then met to finalize scorecard objectives, measures, targets, and the initiatives to achieve the targets. Management accountants played an important role in the design and implementation of the balanced scorecard, particularly in determining measures to represent the realities of the business. This required management accountants to understand the economic environment of the industry, Chipset's customers and competitors, and internal business issues such as human resources, operations, and distribution.

Managers made sure that employees understood the scorecard and the scorecard process. The final balanced scorecard was communicated to all employees. Sharing the scorecard allowed engineers and operating personnel, for example, to understand the reasons for customer satisfaction and dissatisfaction and to make suggestions for improving internal processes directly aimed at satisfying customers and implementing Chipset's strategy. Too often, scorecards are seen by only a select group of managers. By limiting the scorecard's exposure, an organization loses the opportunity for widespread organization engagement and alignment.

Chipset (like Cigna Property, Casualty Insurance, and Wells Fargo) also encourages each department to develop its own scorecard that ties into Chipset's main scorecard described in Exhibit 13-3. For example, the quality control department's scorecard has measures that its department managers use to improve yield—number of quality circles, statistical process control charts, Pareto diagrams, and root-cause analyses (see

Chapter 19, pp. 675–677 for more details). Department scorecards help align the actions of each department to implement Chipset’s strategy.

Companies frequently use balanced scorecards to evaluate and reward managerial performance and to influence managerial behavior. Using the balanced scorecard for performance evaluation widens the performance management lens and motivates managers to give greater attention to nonfinancial drivers of performance. Surveys indicate, however, that companies continue to assign more weight to the financial perspective (55%) than to the other perspectives—customer (19%), internal business process (12%), and learning and growth (14%). Companies cite several reasons for the relatively smaller weight on nonfinancial measures: difficulty evaluating the relative importance of nonfinancial measures; challenges in measuring and quantifying qualitative, nonfinancial data; and difficulty in compensating managers despite poor financial performance (see Chapter 23 for a more detailed discussion of performance evaluation). Many companies, however, are giving greater weight to nonfinancial measures in promotion decisions because they believe that nonfinancial measures (such as customer satisfaction, process improvements, and employee motivation) better assess a manager’s potential to succeed at senior levels of management. For the balanced scorecard to be effective, managers must view it as fairly assessing and rewarding all important aspects of a manager’s performance and promotion prospects.

Aligning the Balanced Scorecard to Strategy

Different strategies call for different scorecards. Recall Chipset’s competitor Visilog, which follows a product-differentiation strategy by designing custom chips for modems and communication networks. Visilog designs its balanced scorecard to fit its strategy. For example, in the financial perspective, Visilog evaluates how much of its operating income comes from charging premium prices for its products. In the customer perspective, Visilog measures the percentage of its revenues from new products and new customers. In the internal-business-process perspective, Visilog measures the number of new products introduced and new product development time. In the learning-and-growth perspective, Visilog measures the development of advanced manufacturing capabilities to produce custom chips. Visilog also uses some of the measures described in Chipset’s balanced scorecard in Exhibit 13-3. For example, revenue growth, customer satisfaction ratings, order-delivery time, on-time delivery, percentage of frontline workers empowered to manage processes, and employee-satisfaction ratings are also important measures under the product-differentiation strategy. The goal is to align the balanced scorecard with company strategy.⁵ Exhibit 13-4 presents some common measures found on company scorecards in the service, retail, and manufacturing sectors.

Features of a Good Balanced Scorecard

A well-designed balanced scorecard has several features:

1. It tells the story of a company’s strategy, articulating a sequence of cause-and-effect relationships—the links among the various perspectives that align implementation of the strategy. In for-profit companies, each measure in the scorecard is part of a cause-and-effect chain leading to financial outcomes. Not-for-profit organizations design the cause-and-effect chain to achieve their strategic service objectives—for example, number of people no longer in poverty, or number of children still in school.
2. The balanced scorecard helps to communicate the strategy to all members of the organization by translating the strategy into a coherent and linked set of understandable and measurable operational targets. Guided by the scorecard, managers and employees take actions and make decisions to achieve the company’s strategy. Companies that have distinct strategic business units (SBUs)—such as consumer

⁵ For simplicity, we have presented the balanced scorecard in the context of companies that have followed either a cost-leadership or a product-differentiation strategy. Of course, a company may have some products for which cost leadership is critical and other products for which product differentiation is important. The company will then develop separate scorecards to implement the different product strategies. In still other contexts, product differentiation may be of primary importance, but some cost leadership must also be achieved. The balanced scorecard measures would then be linked in a cause-and-effect way to this strategy.

Exhibit 13-4**Frequently Cited
Balanced Scorecard
Measures****Financial Perspective***Income measures:* Operating income, gross margin percentage*Revenue and cost measures:* Revenue growth, revenues from new products, cost reductions in key areas*Income and investment measures:* Economic value added ^a(EVA[®]), return on investment**Customer Perspective**

Market share, customer satisfaction, customer-retention percentage, time taken to fulfill customers' requests, number of customer complaints

Internal-Business-Process Perspective*Innovation Process:* Operating capabilities, number of new products or services, new-product development times, and number of new patents*Operations Process:* Yield, defect rates, time taken to deliver product to customers, percentage of on-time deliveries, average time taken to respond to orders, setup time, manufacturing downtime*Postsales Service Process:* Time taken to replace or repair defective products, hours of customer training for using the product**Learning-and-Growth Perspective***Employee measures:* Employee education and skill levels, employee-satisfaction ratings, employee turnover rates, percentage of employee suggestions implemented, percentage of compensation based on individual and team incentives*Technology measures:* Information system availability, percentage of processes with advanced controls^aThis measure is described in Chapter 23.

products and pharmaceuticals at Johnson & Johnson—develop their balanced scorecards at the SBU level. Each SBU has its own unique strategy and implementation goals; building separate scorecards allows each SBU to choose measures that help implement its distinctive strategy.

3. In for-profit companies, the balanced scorecard must motivate managers to take actions that eventually result in improvements in financial performance. Managers sometimes tend to focus too much on innovation, quality, and customer satisfaction as ends in themselves. For example, Xerox spent heavily to increase customer satisfaction without a resulting financial payoff because higher levels of satisfaction did not increase customer loyalty. Some companies use statistical methods, such as regression analysis, to test the anticipated cause-and-effect relationships among nonfinancial measures and financial performance. The data for this analysis can come from either time series data (collected over time) or cross-sectional data (collected, for example, across multiple stores of a retail chain). In the Chipset example, improvements in nonfinancial factors have, in fact, already led to improvements in financial factors.
4. The balanced scorecard limits the number of measures, identifying only the most critical ones. Chipset's scorecard, for example, has 16 measures, between 3 and 6 measures for each perspective. Limiting the number of measures focuses managers' attention on those that most affect strategy implementation. Using too many measures makes it difficult for managers to process relevant information.
5. The balanced scorecard highlights less-than-optimal trade-offs that managers may make when they fail to consider operational and financial measures together. For example, a company whose strategy is innovation and product differentiation could achieve superior short-run financial performance by reducing spending on R&D. A good balanced scorecard would signal that the short-run financial performance might have been achieved by taking actions that hurt future financial performance because a leading indicator of that performance, R&D spending and R&D output, has declined.

Pitfalls in Implementing a Balanced Scorecard

Pitfalls to avoid in implementing a balanced scorecard include the following:

1. Managers should not assume the cause-and-effect linkages are precise. They are merely hypotheses. Over time, a company must gather evidence of the strength and timing of the linkages among the nonfinancial and financial measures. With experience,

organizations should alter their scorecards to include those nonfinancial strategic objectives and measures that are the best leading indicators (the causes) of financial performance (a lagging indicator or the effect). Understanding that the scorecard evolves over time helps managers avoid unproductively spending time and money trying to design the “perfect” scorecard at the outset. Furthermore, as the business environment and strategy change over time, the measures in the scorecard also need to change.

2. Managers should not seek improvements across all of the measures all of the time. For example, strive for quality and on-time performance but not beyond the point at which further improvement in these objectives is so costly that it is inconsistent with long-run profit maximization. Cost-benefit considerations should always be central when designing a balanced scorecard.
3. Managers should not use only objective measures in the balanced scorecard. Chipset’s balanced scorecard includes both objective measures (such as operating income from cost leadership, market share, and manufacturing yield) and subjective measures (such as customer- and employee-satisfaction ratings). When using subjective measures, though, managers must be careful that the benefits of this potentially rich information are not lost by using measures that are inaccurate or that can be easily manipulated.
4. Despite challenges of measurement, top management should not ignore nonfinancial measures when evaluating managers and other employees. Managers tend to focus on the measures used to reward their performance. Excluding nonfinancial measures when evaluating performance will reduce the significance and importance that managers give to nonfinancial measures.

Evaluating the Success of Strategy and Implementation

To evaluate how successful Chipset’s strategy and its implementation have been, its management compares the target- and actual-performance columns in the balanced scorecard (Exhibit 13-3). Chipset met most targets set on the basis of competitor benchmarks in 2011 itself. That’s because, in the Chipset context, improvements in the learning and growth perspective quickly ripple through to the financial perspective. Chipset will continue to seek improvements on the targets it did not achieve, but meeting most targets suggests that the strategic initiatives that Chipset identified and measured for learning and growth resulted in improvements in internal business processes, customer measures, and financial performance.

How would Chipset know if it had problems in strategy implementation? If it did not meet its targets on the two perspectives that are more internally focused: learning and growth and internal business processes.

What if Chipset performed well on learning and growth and internal business processes, but customer measures and financial performance in this year and the next did not improve? Chipset’s managers would then conclude that Chipset did a good job of implementation (the various internal nonfinancial measures it targeted improved) but that its strategy was faulty (there was no effect on customers or on long-run financial performance and value creation). Management failed to identify the correct causal links. It implemented the wrong strategy well! Management would then reevaluate the strategy and the factors that drive it.

Now what if Chipset performed well on its various nonfinancial measures, and operating income over this year and the next also increased? Chipset’s managers might be tempted to declare the strategy a success because operating income increased. Unfortunately, management still cannot conclude with any confidence that Chipset successfully formulated and implemented its strategy. Why? Because operating income can increase simply because entire markets are expanding, not because a company’s strategy has been successful. Also, changes in operating income might occur because of factors outside the strategy. For example, a company such as Chipset that has chosen a cost-leadership strategy may find that its operating-income increase actually resulted from, say, some degree of product differentiation. *To evaluate the success of a strategy, managers and management accountants need to link strategy to the sources of operating-income increases.*

Decision Point

How can an organization translate its strategy into a set of performance measures?

For Chipset to conclude that it was successful in implementing its strategy, it must demonstrate that improvements in its financial performance and operating income over time resulted from achieving targeted cost savings and growth in market share. Fortunately, the top two rows of Chipset's balanced scorecard in Exhibit 13-3 show that operating-income gains from productivity (\$1,912,500) and growth (\$2,820,000) exceeded targets. The next section of this chapter describes how these numbers were calculated. Because its strategy has been successful, Chipset's management can be more confident that the gains will be sustained in subsequent years.

Chipset's management accountants subdivide changes in operating income into components that can be identified with product differentiation, cost leadership, and growth. Why growth? Because successful product differentiation or cost leadership generally increases market share and helps a company to grow. Subdividing the change in operating income to evaluate the success of a strategy is conceptually similar to the variance analysis discussed in Chapters 7 and 8. One difference, however, is that management accountants compare actual operating performance over two different periods, not actual to budgeted numbers in the same time period as in variance analysis.⁶

Strategic Analysis of Operating Income

The following illustration explains how to subdivide the change in operating income from one period to *any* future period. The individual components describe company performance with regard to product differentiation, cost leadership, and growth.⁷ We illustrate the analysis using data from 2010 and 2011 because Chipset implemented key elements of its strategy in late 2010 and early 2011 and expects the financial consequences of these strategies to occur in 2011. Suppose the financial consequences of these strategies had been expected to affect operating income in only 2012. Then we could just as easily have compared 2010 to 2012. If necessary, we could also have compared 2010 to 2011 and 2012 taken together.

Chipset's data for 2010 and 2011 follow:

	2010	2011
1. Units of CX1 produced and sold	1,000,000	1,150,000
2. Selling price	\$23	\$22
3. Direct materials (square centimeters of silicon wafers)	3,000,000	2,900,000
4. Direct material cost per square centimeter	\$1.40	\$1.50
5. Manufacturing processing capacity (in square centimeters of silicon wafer)	3,750,000	3,500,000
6. Conversion costs (all manufacturing costs other than direct material costs)	\$16,050,000	\$15,225,000
7. Conversion cost per unit of capacity (row 6 ÷ row 5)	\$4.28	\$4.35

Chipset provides the following additional information:

1. Conversion costs (labor and overhead costs) for each year depend on production processing capacity defined in terms of the quantity of square centimeters of silicon wafers that Chipset can process. These costs do not vary with the actual quantity of silicon wafers processed.
2. Chipset incurs no R&D costs. Its marketing, sales, and customer-service costs are small relative to the other costs. Chipset has fewer than 10 customers, each purchasing roughly the same quantities of CX1. Because of the highly technical nature of the product, Chipset uses a cross-functional team for its marketing, sales, and customer-service activities. This cross-functional approach ensures that, although marketing, sales, and customer-service costs are small, the entire Chipset organization, including manufacturing engineers, remains focused on increasing customer satisfaction and

Learning Objective 4

Analyze changes in operating income to evaluate strategy

... growth, price recovery, and productivity

⁶ Other examples of focusing on actual performance over two periods rather than comparisons of actuals with budgets can be found in J. Hope and R. Fraser, *Beyond Budgeting* (Boston, MA: Harvard Business School Press, 2003).

⁷ For other details, see R. Banker, S. Datar, and R. Kaplan, "Productivity Measurement and Management Accounting," *Journal of Accounting, Auditing and Finance* (1989): 528–554; and A. Hayzen and J. Reeve, "Examining the Relationships in Productivity Accounting," *Management Accounting Quarterly* (2000): 32–39.

market share. (The Problem for Self-Study at the end of this chapter describes a situation in which marketing, sales, and customer-service costs are significant.)

- Chipset's asset structure is very similar in 2010 and 2011.
- Operating income for each year is as follows:

	2010	2011
Revenues		
(\$23 per unit × 1,000,000 units; \$22 per unit × 1,150,000 units)	<u>\$23,000,000</u>	<u>\$25,300,000</u>
Costs		
Direct material costs		
(\$1.40/sq. cm. × 3,000,000 sq. cm.; \$1.50/sq. cm. × 2,900,000 sq. cm.)	4,200,000	4,350,000
Conversion costs		
(\$4.28/sq. cm. × 3,750,000 sq. cm.; \$4.35/sq. cm. × 3,500,000 sq. cm.)	<u>16,050,000</u>	<u>15,225,000</u>
Total costs	<u>20,250,000</u>	<u>19,575,000</u>
Operating income	<u>\$ 2,750,000</u>	<u>\$ 5,725,000</u>
Change in operating income		↑ \$2,975,000 F ↑

The goal of Chipset's managers is to evaluate how much of the \$2,975,000 increase in operating income was caused by the successful implementation of the company's cost-leadership strategy. To do this, management accountants start by analyzing three main factors: growth, price recovery, and productivity.

The **growth component** measures the change in operating income attributable solely to the change in the quantity of output sold between 2010 and 2011.

The **price-recovery component** measures the change in operating income attributable solely to changes in Chipset's prices of inputs and outputs between 2010 and 2011. The price-recovery component measures change in output price compared with changes in input prices. A company that has successfully pursued a strategy of product differentiation will be able to increase its output price faster than the increase in its input prices, boosting profit margins and operating income: It will show a large positive price-recovery component.

The **productivity component** measures the change in costs attributable to a change in the quantity of inputs used in 2011 relative to the quantity of inputs that would have been used in 2010 to produce the 2011 output. The productivity component measures the amount by which operating income increases by using inputs efficiently to lower costs. A company that has successfully pursued a strategy of cost leadership will be able to produce a given quantity of output with a lower cost of inputs: It will show a large positive productivity component. Given Chipset's strategy of cost leadership, we expect the increase in operating income to be attributable to the productivity and growth components, not to price recovery. We now examine these three components in detail.

Growth Component of Change in Operating Income

The growth component of the change in operating income measures the increase in revenues minus the increase in costs from selling more units of CX1 in 2011 (1,150,000 units) than in 2010 (1,000,000 units), *assuming nothing else has changed*.

Revenue Effect of Growth

$$\begin{aligned}
 \text{Revenue effect of growth} &= \left(\begin{array}{c} \text{Actual units of} \\ \text{output sold} \\ \text{in 2011} \end{array} - \begin{array}{c} \text{Actual units of} \\ \text{output sold} \\ \text{in 2010} \end{array} \right) \times \begin{array}{c} \text{Selling} \\ \text{price} \\ \text{in 2010} \end{array} \\
 &= (1,150,000 \text{ units} - 1,000,000 \text{ units}) \times \$23 \text{ per unit} \\
 &= \$3,450,000 \text{ F}
 \end{aligned}$$

This component is favorable (F) because the increase in output sold in 2011 increases operating income. Components that decrease operating income are unfavorable (U).

Note that Chipset uses the 2010 price of CX1 and focuses only on the increase in units sold between 2010 and 2011, because the revenue effect of growth component measures how much revenues would have changed in 2010 if Chipset had sold 1,150,000 units instead of 1,000,000 units.

Cost Effect of Growth

The cost effect of growth measures how much costs would have changed in 2010 if Chipset had produced 1,150,000 units of CX1 instead of 1,000,000 units. To measure the cost effect of growth, Chipset's managers distinguish variable costs such as direct material costs from fixed costs such as conversion costs, because as units produced (and sold) increase, variable costs increase proportionately but fixed costs, generally, do not change.

$$\begin{aligned} \text{Cost effect of growth for variable costs} &= \left(\begin{array}{l} \text{Units of input} \\ \text{required to} \\ \text{produce 2011} \\ \text{output in 2010} \end{array} - \begin{array}{l} \text{Actual units of} \\ \text{input used} \\ \text{to produce} \\ \text{2010 output} \end{array} \right) \times \begin{array}{l} \text{Input} \\ \text{price} \\ \text{in 2010} \end{array} \\ \text{Cost effect of growth for direct materials} &= \left(3,000,000 \text{ sq. cm.} \times \frac{1,150,000 \text{ units}}{1,000,000 \text{ units}} - 3,000,000 \text{ sq. cm.} \right) \times \$1.40 \text{ per sq. cm.} \\ &= (3,450,000 \text{ sq. cm.} - 3,000,000 \text{ sq. cm.}) \times \$1.40 \text{ per sq. cm.} = \$630,000 \text{ U} \end{aligned}$$

The units of input required to produce 2011 output in 2010 can also be calculated as follows:

$$\text{Units of input per unit of output in 2010} = \frac{3,000,000 \text{ sq. cm.}}{1,000,000 \text{ units}} = 3 \text{ sq. cm./unit}$$

Units of input required to produce 2011 output of 1,150,000 units in 2010 = 3 sq. cm. per unit \times 1,150,000 units = 3,450,000 sq. cm.

$$\text{Cost effect of growth for fixed costs} = \left(\begin{array}{l} \text{Actual units of capacity in} \\ \text{2010 because adequate capacity} \\ \text{exists to produce 2011 output in 2010} \end{array} - \begin{array}{l} \text{Actual units} \\ \text{of capacity} \\ \text{in 2010} \end{array} \right) \times \begin{array}{l} \text{Price per} \\ \text{unit of} \\ \text{capacity} \\ \text{in 2010} \end{array}$$

$$\begin{aligned} \text{Cost effect of growth for conversion costs} &= (3,750,000 \text{ sq. cm.} - 3,750,000 \text{ sq. cm.}) \times \$4.28 \text{ per sq. cm.} = \$0 \end{aligned}$$

Conversion costs are fixed costs at a given level of capacity. Chipset has manufacturing capacity to process 3,750,000 square centimeters of silicon wafers in 2010 at a cost of \$4.28 per square centimeter (rows 5, and 7 of data on p. 478). To produce 1,150,000 units of output in 2010, Chipset needs to process 3,450,000 square centimeters of direct materials, which is less than the available capacity of 3,750,000 sq. cm. Throughout this chapter, we assume adequate capacity exists in the current year (2010) to produce next year's (2011) output. Under this assumption, the cost effect of growth for capacity-related fixed costs is, by definition, \$0. Had 2010 capacity been inadequate to produce 2011 output in 2010, we would need to calculate the additional capacity required to produce 2011 output in 2010. These calculations are beyond the scope of the book.

In summary, the net increase in operating income attributable to growth equals the following:

Revenue effect of growth		\$3,450,000 F
Cost effect of growth		
Direct material costs	\$630,000 U	
Conversion costs	0	630,000 U
Change in operating income due to growth		<u>\$2,820,000 F</u>

Price-Recovery Component of Change in Operating Income

Assuming that the 2010 relationship between inputs and outputs continued in 2011, the price-recovery component of the change in operating income measures solely the effect of price changes on revenues and costs to produce and sell the 1,150,000 units of CX1 in 2011.

Revenue Effect of Price Recovery

$$\begin{aligned} \text{Revenue effect of price recovery} &= \left(\begin{array}{c} \text{Selling price} \\ \text{in 2011} \end{array} - \begin{array}{c} \text{Selling price} \\ \text{in 2010} \end{array} \right) \times \begin{array}{c} \text{Actual units} \\ \text{of output} \\ \text{sold in 2011} \end{array} \\ &= (\$22 \text{ per unit} - \$23 \text{ per unit}) \times 1,150,000 \text{ units} \\ &= \$1,150,000 \text{ U} \end{aligned}$$

Note that the calculation focuses on revenue changes caused by changes in the selling price of CX1 between 2010 and 2011.

Cost Effect of Price Recovery

Chipset's management accountants calculate the cost effects of price recovery separately for variable costs and for fixed costs, just as they did when calculating the cost effect of growth.

$$\begin{array}{l} \text{Cost effect of} \\ \text{price recovery for} \\ \text{variable costs} \end{array} = \left(\begin{array}{c} \text{Input price} \\ \text{in 2011} \end{array} - \begin{array}{c} \text{Input price} \\ \text{in 2010} \end{array} \right) \times \begin{array}{c} \text{Units of input} \\ \text{required to} \\ \text{produce 2011} \\ \text{output in 2010} \end{array}$$

$$\begin{array}{l} \text{Cost effect of} \\ \text{price recovery for} \\ \text{direct materials} \end{array} = (\$1.50 \text{ per sq. cm.} - \$1.40 \text{ per sq. cm.}) \times 3,450,000 \text{ sq.} = \$345,000 \text{ U}$$

Recall that the direct materials of 3,450,000 square centimeters required to produce 2011 output in 2010 had already been calculated when computing the cost effect of growth (p. 480).

$$\begin{array}{l} \text{Cost effect of} \\ \text{price recovery for} \\ \text{fixed costs} \end{array} = \left(\begin{array}{c} \text{Price per} \\ \text{unit of} \\ \text{capacity} \\ \text{in 2011} \end{array} - \begin{array}{c} \text{Price per} \\ \text{unit of} \\ \text{capacity} \\ \text{in 2010} \end{array} \right) \times \begin{array}{c} \text{Actual units of capacity in} \\ \text{2010 (because adequate} \\ \text{capacity exists to produce} \\ \text{2011 output in 2010)} \end{array}$$

Cost effect of price recovery for fixed costs is as follows:

$$\text{Conversion costs: } (\$4.35 \text{ per sq. cm.} - \$4.28 \text{ per sq. cm.}) \times 3,750,000 \text{ sq. cm.} = \$262,500 \text{ U}$$

Note that the detailed analyses of capacities were presented when computing the cost effect of growth (p. 480).

In summary, the net decrease in operating income attributable to price recovery equals the following:

Revenue effect of price recovery		\$1,150,000 U
Cost effect of price recovery		
Direct material costs	\$345,000 U	
Conversion costs	<u>262,500 U</u>	<u>607,500 U</u>
Change in operating income due to price recovery		<u>\$1,757,500 U</u>

The price-recovery analysis indicates that, even as the prices of its inputs increased, the selling prices of CX1 decreased and Chipset could not pass on input-price increases to its customers.

Productivity Component of Change in Operating Income

The productivity component of the change in operating income uses 2011 input prices to measure how costs have decreased as a result of using fewer inputs, a better mix of inputs, and/or less capacity to produce 2011 output, compared with the inputs and capacity that would have been used to produce this output in 2010.

The productivity-component calculations use 2011 prices and output. That's because the productivity component isolates the change in costs between 2010 and 2011 caused solely by the change in the quantities, mix, and/or capacities of inputs.⁸

$$\text{Cost effect of productivity for variable costs} = \left(\begin{array}{l} \text{Actual units of} \\ \text{input used} \\ \text{to produce} \\ \text{2011 output} \end{array} - \begin{array}{l} \text{Units of input} \\ \text{required to} \\ \text{produce 2011} \\ \text{output in 2010} \end{array} \right) \times \begin{array}{l} \text{Input} \\ \text{price} \\ \text{in 2011} \end{array}$$

Using the 2011 data given on page 478 and the calculation of units of input required to produce 2011 output in 2010 when discussing the cost effects of growth (p. 480),

$$\begin{aligned} \text{Cost effect of} \\ \text{productivity for} \\ \text{direct materials} &= (2,900,000 \text{ sq. cm.} - 3,450,000 \text{ sq. cm.}) \times \$1.50 \text{ per sq. cm} \\ &= 550,000 \text{ sq. cm.} \times \$1.50 \text{ per sq. cm.} = \$825,000 \text{ F} \end{aligned}$$

Chipset's quality and yield improvements reduced the quantity of direct materials needed to produce output in 2011 relative to 2010.

$$\text{Cost effect of productivity for fixed costs} = \left(\begin{array}{l} \text{Actual units of} \\ \text{capacity} \\ \text{in 2011} \end{array} - \begin{array}{l} \text{Actual units of capacity in} \\ \text{2010 because adequate} \\ \text{capacity exists to produce} \\ \text{2011 output in 2010} \end{array} \right) \times \begin{array}{l} \text{Price per} \\ \text{unit of} \\ \text{capacity} \\ \text{in 2011} \end{array}$$

To calculate the cost effect of productivity for fixed costs, we use the 2011 data given on page 478, and the analyses of capacity required to produce 2011 output in 2010 when discussing the cost effect of growth (p. 480).

Cost effects of productivity for fixed costs are

$$\text{Conversion costs: } (3,500,000 \text{ sq. cm} - 3,750,000 \text{ sq. cm.}) \times \$4.35 \text{ per sq. cm.} = \$1,087,500 \text{ F}$$

Chipset's managers decreased manufacturing capacity in 2011 to 3,500,000 square centimeters by selling off old equipment and laying off workers.

In summary, the net increase in operating income attributable to productivity equals,

Cost effect of productivity	
Direct material costs	\$ 825,000 F
Conversion costs	<u>1,087,500 F</u>
Change in operating income due to productivity	<u>1,912,500 F</u>

The productivity component indicates that Chipset was able to increase operating income by improving quality and productivity and eliminating capacity to reduce costs. The appendix to this chapter examines partial and total factor productivity changes between 2010 and 2011 and describes how the management accountant can obtain a deeper understanding of Chipset's cost-leadership strategy. Note that the productivity component focuses exclusively on costs, so there is no revenue effect for this component.

Exhibit 13-5 summarizes the growth, price-recovery, and productivity components of the changes in operating income. Generally, companies that have been successful at cost leadership will show favorable productivity and growth components. Companies that

⁸ Note that the productivity-component calculation uses actual 2011 input prices, whereas its counterpart, the efficiency variance in Chapters 7 and 8, uses budgeted prices. (In effect, the budgeted prices correspond to 2010 prices). Year 2011 prices are used in the productivity calculation because Chipset wants its managers to choose input quantities to minimize costs in 2011 based on currently prevailing prices. If 2010 prices had been used in the productivity calculation, managers would choose input quantities based on irrelevant input prices that prevailed a year ago! Why does using budgeted prices in Chapters 7 and 8 not pose a similar problem? Because, unlike 2010 prices that describe what happened a year ago, budgeted prices represent prices that are expected to prevail in the current period. Moreover, budgeted prices can be changed, if necessary, to bring them in line with actual current-period prices.

Exhibit 13-5

Strategic Analysis of Profitability

	Income Statement Amounts in 2010 (1)	Revenue and Cost Effects of Growth Component in 2011 (2)	Revenue and Cost Effects of Price-Recovery Component in 2011 (3)	Cost Effect of Productivity Component in 2011 (4)	Income Statement Amounts in 2011 (5) = (1) + (2) + (3) + (4)
Revenues	\$23,000,000	\$3,450,000 F	\$1,150,000 U	—	\$25,300,000
Costs	20,250,000	630,000 U	607,500 U	\$1,912,000 F	19,575,000
Operating income	<u>\$ 2,750,000</u>	<u>\$2,820,000 F</u>	<u>\$1,757,500 U</u>	<u>\$1,912,500 F</u>	<u>\$ 5,725,000</u>
	↑		\$2,975,000 F		↑
			Change in operating income		

have successfully differentiated their products will show favorable price-recovery and growth components. In Chipset's case, consistent with its strategy and its implementation, productivity contributed \$1,912,500 to the increase in operating income, and growth contributed \$2,820,000. Price-recovery contributed a \$1,757,500 decrease in operating income, however, because, even as input prices increased, the selling price of CX1 decreased. Had Chipset been able to differentiate its product and charge a higher price, the price-recovery effects might have been less unfavorable or perhaps even favorable. As a result, Chipset's managers plan to evaluate some modest changes in product features that might help differentiate CX1 somewhat more from competing products.

Further Analysis of Growth, Price-Recovery, and Productivity Components

As in all variance and profit analysis, Chipset's managers want to more closely analyze the change in operating income. Chipset's growth might have been helped, for example, by an increase in industry market size. Therefore, at least part of the increase in operating income may be attributable to favorable economic conditions in the industry rather than to any successful implementation of strategy. Some of the growth might relate to the management decision to decrease selling price, made possible by the productivity gains. In this case, the increase in operating income from cost leadership must include operating income from productivity-related growth in market share in addition to the productivity gain.

We illustrate these ideas, using the Chipset example and the following additional information. *Instructors who do not wish to cover these detailed calculations can go to the next section on "Applying the Five-Step Decision-Making Framework to Strategy" without any loss of continuity.*

- The market growth rate in the industry is 8% in 2011. Of the 150,000 (1,150,000 – 1,000,000) units of increased sales of CX1 between 2010 and 2011, 80,000 (0.08 × 1,000,000) units are due to an increase in industry market size (which Chipset should have benefited from regardless of its productivity gains), and the remaining 70,000 units are due to an increase in market share.
- During 2011, Chipset could have maintained the price of CX1 at the 2010 price of \$23 per unit. But management decided to take advantage of the productivity gains to reduce the price of CX1 by \$1 to grow market share leading to the 70,000-unit increase in sales.

The effect of the industry-market-size factor on operating income (not any specific strategic action) is as follows:

$$\text{Change in operating income due to growth in industry market size} \\ \$2,820,000 \text{ (Exhibit 13-5, column 2)} \times \frac{80,000 \text{ units}}{150,000 \text{ units}} = \underline{\underline{\$1,504,000 \text{ F}}}$$

Concepts in Action

The Growth Versus Profitability Choice at Facebook



Competitive advantage comes from product differentiation or cost leadership. Successful implementation of these strategies helps a company to be profitable and to grow. Many Internet start-ups pursue a strategy of short-run growth to build a customer base, with the goal of later benefiting from such growth by either charging user fees or sustaining a free service for users supported by advertisers. However, during the 1990s dot-com boom (and subsequent bust), the most spectacular failures occurred in dot-com companies that followed the “get big fast” model but then failed to differentiate their products or reduce their costs.

Today, many social networking companies (Web-based communities that connect friends, colleagues, and groups with shared interests) face this same challenge. At Facebook, the most notable of the social networking sites, users can create personal profiles that allow them to interact with friends through messaging, chat, sharing Web site links, video clips, and more. Additionally, Facebook encourages other companies to build third-party programs, including games and surveys, for its Web site and mobile applications on the iPhone and BlackBerry devices. From 2007 to 2010, Facebook grew from 12 million users to more than 400 million users uploading photos, sharing updates, planning events, and playing games in the Facebook ecosystem.

During this phenomenal growth, the company wrestled with one key question: How could Facebook become profitable? In 2009, experts estimate that Facebook had revenues of \$635 million, mostly through advertising and the sale of virtual gifts (as a private company, Facebook does not publicly disclose its financial information). But the company still did not turn a profit. Why not? To keep its global Web site and mobile applications operating, Facebook requires a massive amount of electricity, Internet bandwidth, and storage servers for digital files. In 2009, the company earmarked \$100 million to buy 50,000 new servers, along with a new \$2 million network storage system per week.

The cost structure of Facebook means that the company must generate tens of millions a month in revenue to sustain its operations over the long term. But how? Facebook has implemented the following popular methods of online revenue generation:

- **Additional advertising:** To grow its already significant advertising revenue, Facebook recently introduced “Fan Pages” for brands and companies seeking to communicate directly with its users. The company is also working on a tool that will let users share information about their physical whereabouts via the site, which will allow Facebook to sell targeted advertisements for nearby businesses.
- **Transactions:** Facebook is also testing a feature that would expand Facebook Credits, its transactions platform that allows users to purchase games and gifts, into an Internet-wide “virtual currency,” that could be accepted by any Web site integrating the Facebook Connect online identity management platform. Facebook currently gets a 30% cut of all transactions conducted through Facebook Credits.

Despite rampant rumors, Facebook has rejected the idea of charging monthly subscription fees for access to its Web site or for advanced features and premium content.

With increased growth around the world, Facebook anticipates 2010 revenues to exceed \$1 billion. Despite the opportunity to become the “world’s richest twenty-something,” Facebook’s 25-year-old CEO Mark Zuckerberg has thus far resisted taking the company public through an initial public offering (IPO). “A lot of companies can go off course because of corporate pressures,” says Mr. Zuckerberg. “I don’t know what we are going to be building five years from now.” With his company’s focus on facilitating people’s ability to share almost any- and everything with anyone, at any time, via the Internet, mobile phones, and even videogames, Facebook expects to offer users a highly personal and differentiated online experience in the years ahead and expects that this product differentiation will drive its future growth and profitability.

Sources: Vascellaro, Jessica E. 2010. Facebook CEO in no rush to ‘friend’ wall street. *Wall Street Journal*, March 3. <http://online.wsj.com/article/SB10001424052748703787304575075942803630712.html>; Eldon, Eric. 2010. Facebook revenues up to \$700 million in 2009, on track towards \$1.1 billion in 2010. *Inside Facebook*. Blog, March 2. <http://www.insidefacebook.com/2010/03/02/facebook-made-up-to-700-million-in-2009-on-track-towards-1-1-billion-in-2010/>; Arrington, Michael. 2010. Facebook may be growing too fast. And hitting the capital markets again. *Tech Crunch*. Blog, October 31. <http://techcrunch.com/2010/10/31/facebooks-growing-problem/>

Lacking a differentiated product, Chipset could have maintained the price of CX1 at \$23 per unit even while the prices of its inputs increased.

The effect of product differentiation on operating income is as follows:

Change in prices of inputs (cost effect of price recovery)	607,500 U
Change in operating income due to product differentiation	<u>\$607,500 U</u>

To exercise cost and price leadership, Chipset made the strategic decision to cut the price of CX1 by \$1. This decision resulted in an increase in market share and 70,000 units of additional sales.

The effect of cost leadership on operating income is as follows:

Productivity component	\$1,912,500 F
Effect of strategic decision to reduce price (\$1/unit × 1,150,000 units)	1,150,000 U
Growth in market share due to productivity improvement and strategic decision to reduce prices	
\$2,820,000 (Exhibit 13-5, column 2) × $\frac{70,000 \text{ units}}{150,000 \text{ units}}$	<u>1,316,000 F</u>
Change in operating income due to cost leadership	<u>\$2,078,500 F</u>

A summary of the change in operating income between 2010 and 2011 follows.

Change due to industry market size	\$1,504,000 F
Change due to product differentiation	607,500 U
Change due to cost leadership	<u>2,078,500 F</u>
Change in operating income	<u>\$2,975,000 F</u>

Consistent with its cost-leadership strategy, the productivity gains of \$1,912,500 in 2011 were a big part of the increase in operating income from 2010 to 2011. Chipset took advantage of these productivity gains to decrease price by \$1 per unit at a cost of \$1,150,000 to gain \$1,316,000 in operating income by selling 70,000 additional units. The Problem for Self-Study on page 488 describes the analysis of the growth, price-recovery, and productivity components for a company following a product-differentiation strategy. The Concepts in Action feature (p. 484) describes the unique challenges that dot-com companies face in choosing a profitable strategy.

Under different assumptions about the change in selling price, the analysis will attribute different amounts to the different strategies.

Applying the Five-Step Decision-Making Framework to Strategy

We next briefly describe how the five-step decision-making framework, introduced in Chapter 1, is also useful in making decisions about strategy.

1. *Identify the problem and uncertainties.* Chipset’s strategy choice depends on resolving two uncertainties—whether Chipset can add value to its customers that its competitors cannot emulate, and whether Chipset can develop the necessary internal capabilities to add this value.
2. *Obtain information.* Chipset’s managers develop customer preference maps to identify various product attributes desired by customers and the competitive advantage or disadvantage it has on each attribute relative to competitors. The managers also gather data on Chipset’s internal capabilities. How good is Chipset in designing and developing innovative new products? How good are its process and marketing capabilities?
3. *Make predictions about the future.* Chipset’s managers conclude that they will not be able to develop innovative new products in a cost-effective way. They believe that Chipset’s strength lies in improving quality, reengineering processes, reducing costs, and delivering products faster to customers.

◀ **Decision Point**

How can a company analyze changes in operating income to evaluate the success of its strategy?

4. *Make decisions by choosing among alternatives.* Chipset's management decides to follow a cost leadership rather than a product differentiation strategy. It decides to introduce a balanced scorecard to align and measure its quality improvement and process reengineering efforts.
5. *Implement the decision, evaluate performance, and learn.* On its balanced scorecard, Chipset's managers compare actual and targeted performance and evaluate possible cause-and-effect relationships. They learn, for example, that increasing the percentage of processes with advanced controls improves yield. As a result, just as they had anticipated, productivity and growth initiatives result in increases in operating income in 2011. The one change Chipset's managers plan for 2012 is to make modest changes in product features that might help differentiate CX1 somewhat from competing products. In this way, feedback and learning help in the development of future strategies and implementation plans.

Downsizing and the Management of Processing Capacity

As we saw in our discussion of the productivity component, fixed costs are tied to capacity. Unlike variable costs, fixed costs do not change automatically with changes in activity level (for example, fixed conversion costs do not change with changes in the quantity of silicon wafers started into production). How then can managers reduce capacity-based fixed costs? By measuring and managing unused capacity. **Unused capacity** is the amount of productive capacity available over and above the productive capacity employed to meet consumer demand in the current period. To understand unused capacity, it is necessary to distinguish *engineered costs* from *discretionary costs*.

Engineered and Discretionary Costs

Engineered costs result from a cause-and-effect relationship between the cost driver—output—and the (direct or indirect) resources used to produce that output. Engineered costs have a detailed, physically observable, and repetitive relationship with output. In the Chipset example, direct material costs are *direct engineered costs*. Conversion costs are an example of *indirect engineered costs*. Consider 2011. The output of 1,150,000 units of CX1 and the efficiency with which inputs are converted into outputs result in 2,900,000 square centimeters of silicon wafers being started into production. Manufacturing-conversion-cost resources used equal \$12,615,000 ($\$4.35 \text{ per sq. cm.} \times 2,900,000 \text{ sq. cm.}$), but actual conversion costs (\$15,225,000) are higher because Chipset has manufacturing capacity to process 3,500,000 square centimeters of silicon wafer ($\$4.35 \text{ per sq. cm.} \times 3,500,000 \text{ sq. cm.} = \$15,225,000$). Although these costs are fixed in the short run, over the long run there is a cause-and-effect relationship between output and manufacturing capacity required (and conversion costs needed). In the long run, Chipset will try to match its capacity to its needs.

Discretionary costs have two important features: (1) They arise from periodic (usually annual) decisions regarding the maximum amount to be incurred, and (2) they have no measurable cause-and-effect relationship between output and resources used. There is often a delay between when a resource is acquired and when it is used. Examples of discretionary costs include advertising, executive training, R&D, and corporate-staff department costs such as legal, human resources, and public relations. Unlike engineered costs, the relationship between discretionary costs and output is a blackbox because it is nonrepetitive and nonroutine. A noteworthy aspect of discretionary costs is that managers are seldom confident that the “correct” amounts are being spent. The founder of Lever Brothers, an international consumer-products

Learning Objective 5

Identify unused capacity

... capacity available minus capacity used for engineered costs but difficult to determine for discretionary costs

and how to manage it

... downsize to reduce capacity

company, once noted, “Half the money I spend on advertising is wasted; the trouble is, I don’t know which half!”⁹

Identifying Unused Capacity for Engineered and Discretionary Overhead Costs

Identifying unused capacity is very different for engineered costs compared to discretionary costs. Consider engineered conversion costs.

At the start of 2011, Chipset had capacity to process 3,750,000 square centimeters of silicon wafers. Quality and productivity improvements made during 2011 enabled Chipset to produce 1,150,000 units of CX1 by processing 2,900,000 square centimeters of silicon wafers. Unused manufacturing capacity is 850,000 (3,750,000 – 2,900,000) square centimeters of silicon-wafer processing capacity at the beginning of 2011. At the 2011 conversion cost of \$4.35 per square centimeter,

$$\begin{aligned} \text{Cost of unused capacity} &= \text{Cost of capacity at the beginning of the year} - \text{Manufacturing resources used during the year} \\ &= (3,750,000 \text{ sq. cm.} \times \$4.35 \text{ per sq. cm.}) - (2,900,000 \text{ sq. cm.} \times \$4.35 \text{ per sq. cm.}) \\ &= \$16,312,500 - \$12,615,000 = \$3,697,500 \end{aligned}$$

The absence of a cause-and-effect relationship makes identifying unused capacity for discretionary costs difficult. For example, management cannot determine the R&D resources used for the actual output produced. And without a measure of capacity used, it is not possible to compute unused capacity.

Managing Unused Capacity

What actions can Chipset management take when it identifies unused capacity? In general, it has two alternatives: eliminate unused capacity, or grow output to utilize the unused capacity.

In recent years, many companies have *downsized* in an attempt to eliminate unused capacity. **Downsizing** (also called **rightsizing**) is an integrated approach of configuring processes, products, and people to match costs to the activities that need to be performed to operate effectively and efficiently in the present and future. Companies such as AT&T, Delta Airlines, Ford Motor Company, and IBM have downsized to focus on their core businesses and have instituted organization changes to increase efficiency, reduce costs, and improve quality. However, downsizing often means eliminating jobs, which can adversely affect employee morale and the culture of a company.

Consider Chipset’s alternatives with respect to its unused manufacturing capacity. Because it needed to process 2,900,000 square centimeters of silicon wafers in 2011, it could have reduced capacity to 3,000,000 square centimeters (Chipset can add or reduce manufacturing capacity in increments of 250,000 sq. cm.), resulting in cost savings of \$3,262,500 [(3,750,000 sq. cm. – 3,000,000 sq. cm.) × \$4.35 per sq. cm.]. Chipset’s strategy, however, is not just to reduce costs but also to grow its business. So early in 2011, Chipset reduces its manufacturing capacity by only 250,000 square centimeters—from 3,750,000 square centimeters to 3,500,000 square centimeters—saving

⁹ Managers also describe some costs as infrastructure costs—costs that arise from having property, plant, and equipment and a functioning organization. Examples are depreciation, long-run lease rental, and the acquisition of long-run technical capabilities. These costs are generally fixed costs because they are committed to and acquired before they are used. Infrastructure costs can be engineered or discretionary. For instance, manufacturing-overhead cost incurred at Chipset to acquire manufacturing capacity is an infrastructure cost that is an example of an engineered cost. In the long run, there is a cause-and-effect relationship between output and manufacturing-overhead costs needed to produce that output. R&D cost incurred to acquire technical capability is an infrastructure cost that is an example of a discretionary cost. There is no measurable cause-and-effect relationship between output and R&D cost incurred.

Decision Point

How can a company identify and manage unused capacity?

\$1,087,500 (\$4.35 per sq. cm. \times 250,000 sq. cm.). It retains some extra capacity for future growth. By avoiding greater reductions in capacity, it also maintains the morale of its skilled and capable workforce. The success of this strategy will depend on Chipset achieving the future growth it has projected.

Because identifying unused capacity for discretionary costs, such as R&D costs, is difficult, downsizing or otherwise managing this unused capacity is also difficult. Management must exercise considerable judgment in deciding the level of R&D costs that would generate the needed product and process improvements. Unlike engineered costs, there is no clear-cut way to know whether management is spending too much (or too little) on R&D.

Problem for Self-Study

Following a strategy of product differentiation, Westwood Corporation makes a high-end kitchen range hood, KE8. Westwood's data for 2010 and 2011 follow:

	2010	2011
1. Units of KE8 produced and sold	40,000	42,000
2. Selling price	\$100	\$110
3. Direct materials (square feet)	120,000	123,000
4. Direct material cost per square foot	\$10	\$11
5. Manufacturing capacity for KE8	50,000 units	50,000 units
6. Conversion costs	\$1,000,000	\$1,100,000
7. Conversion cost per unit of capacity (row 6 \div row 5)	\$20	\$22
8. Selling and customer-service capacity	30 customers	29 customers
9. Selling and customer-service costs	\$720,000	\$725,000
10. Cost per customer of selling and customer-service capacity (row 9 \div row 8)	\$24,000	\$25,000

In 2011, Westwood produced no defective units and reduced direct material usage per unit of KE8. Conversion costs in each year are tied to manufacturing capacity. Selling and customer service costs are related to the number of customers that the selling and service functions are designed to support. Westwood has 23 customers (wholesalers) in 2010 and 25 customers in 2011.

Required

- Describe briefly the elements you would include in Westwood's balanced scorecard.
- Calculate the growth, price-recovery, and productivity components that explain the change in operating income from 2010 to 2011.
- Suppose during 2011, the market size for high-end kitchen range hoods grew 3% in terms of number of units and all increases in market share (that is, increases in the number of units sold greater than 3%) are due to Westwood's product-differentiation strategy. Calculate how much of the change in operating income from 2010 to 2011 is due to the industry-market-size factor, cost leadership, and product differentiation.
- How successful has Westwood been in implementing its strategy? Explain.

Solution

- The balanced scorecard should describe Westwood's product-differentiation strategy. Elements that should be included in its balanced scorecard are as follows:
 - **Financial perspective.** Increase in operating income from higher margins on KE8 and from growth
 - **Customer perspective.** Customer satisfaction and market share in the high-end market
 - **Internal business process perspective.** New product features, development time for new products, improvements in manufacturing processes, manufacturing quality, order-delivery time, and on-time delivery
 - **Learning-and-growth perspective.** Percentage of employees trained in process and quality management and employee satisfaction ratings

2. Operating income for each year is as follows:

	2010	2011
Revenues		
(\$100 per unit × 40,000 units; \$110 per unit × 42,000 units)	\$4,000,000	\$4,620,000
Costs		
Direct material costs		
(\$10 per sq. ft. × 120,000 sq. ft.; \$11 per sq. ft. × 123,000 sq. ft.)	1,200,000	1,353,000
Conversion costs		
(\$20 per unit × 50,000 units; \$22 per unit × 50,000 units)	1,000,000	1,100,000
Selling and customer-service cost		
(\$24,000 per customer × 30 customers;		
\$25,000 per customer × 29 customers)	720,000	725,000
Total costs	<u>2,920,000</u>	<u>3,178,000</u>
Operating income	<u>\$1,080,000</u>	<u>\$1,442,000</u>
Change in operating income		↑ \$362,000 F ↑

Growth Component of Operating Income Change

$$\begin{aligned} \text{Revenue effect of growth} &= \left(\begin{array}{cc} \text{Actual units of} & \text{Actual units of} \\ \text{output sold} & \text{output sold} \\ \text{in 2011} & \text{in 2010} \end{array} \right) \times \begin{array}{c} \text{Selling} \\ \text{price} \\ \text{in 2010} \end{array} \\ &= (42,000 \text{ units} - 40,000 \text{ units}) \times \$100 \text{ per unit} = \$200,000 \text{ F} \end{aligned}$$

$$\begin{aligned} \text{Cost effect of growth for} &= \left(\begin{array}{cc} \text{Units of input} & \text{Actual units of input} \\ \text{required to produce} & \text{used to produce} \\ \text{2011 output in 2010} & \text{2010 output} \end{array} \right) \times \begin{array}{c} \text{Input} \\ \text{price} \\ \text{in 2010} \end{array} \\ \text{variable costs} & \end{aligned}$$

$$\begin{aligned} \text{Cost effect of growth for} &= \left(120,000 \text{ sq. ft.} \times \frac{42,000 \text{ units}}{40,000 \text{ units}} - 120,000 \text{ sq. ft.} \right) \times \$10 \text{ per sq. ft.} \\ \text{direct materials} & \\ &= (126,000 \text{ sq. ft.} - 120,000 \text{ sq. ft.}) \times \$10 \text{ per sq. ft.} = \$60,000 \text{ U} \end{aligned}$$

$$\begin{aligned} \text{Cost effect of growth for} &= \left(\begin{array}{cc} \text{Actual units of capacity in} & \text{Actual units} \\ \text{2010, because adequate capacity} & \text{of capacity} \\ \text{exists to produce 2011 output in 2010} & \text{in 2010} \end{array} \right) \times \begin{array}{c} \text{Price per} \\ \text{unit of} \\ \text{capacity} \\ \text{in 2010} \end{array} \\ \text{fixed costs} & \end{aligned}$$

Cost effects of growth for fixed costs are as follows:

$$\text{Conversion costs: } (50,000 \text{ units} - 50,000 \text{ units}) \times \$20 \text{ per unit} = \$0$$

$$\text{Selling and customer-service costs: } (30 \text{ customers} - 30 \text{ customers}) \times \$24,000 \text{ per customer} = \$0$$

In summary, the net increase in operating income attributable to growth equals the following:

Revenue effect of growth		\$200,000 F
Cost effect of growth		
Direct material costs	\$60,000 U	
Conversion costs	0	
Selling and customer-service costs	0	<u>60,000 U</u>
Change in operating income due to growth		<u>\$140,000 F</u>

Price-Recovery Component of Operating-Income Change

$$\begin{aligned} \text{Revenue effect of price recovery} &= \left(\begin{array}{c} \text{Selling price} \\ \text{in 2011} \end{array} - \begin{array}{c} \text{Selling price} \\ \text{in 2010} \end{array} \right) \times \begin{array}{c} \text{Actual units} \\ \text{of output} \\ \text{sold in 2011} \end{array} \\ &= (\$110 \text{ per unit} - \$100 \text{ per unit}) \times 42,000 \text{ units} = \$420,000 \text{ F} \end{aligned}$$

$$\begin{aligned} \text{Cost effect of price recovery} &= \left(\begin{array}{c} \text{Input} \\ \text{price} \\ \text{in 2011} \end{array} - \begin{array}{c} \text{Input} \\ \text{price} \\ \text{in 2010} \end{array} \right) \times \begin{array}{c} \text{Units of input} \\ \text{required to produce} \\ \text{2011 output in 2010} \end{array} \\ \text{for variable costs} & \end{aligned}$$

$$\text{Direct material costs: } (\$11 \text{ per sq. ft.} - \$10 \text{ per sq. ft.}) \times 126,000 \text{ sq. ft.} = \$126,000 \text{ U}$$

$$\begin{aligned} \text{Cost effect of price recovery} &= \left(\begin{array}{c} \text{Price per} \\ \text{unit of} \\ \text{capacity} \\ \text{in 2011} \end{array} - \begin{array}{c} \text{Price per} \\ \text{unit of} \\ \text{capacity} \\ \text{in 2010} \end{array} \right) \times \begin{array}{c} \text{Actual units of capacity in} \\ \text{2010, because adequate capacity} \\ \text{exists to produce 2011 output in 2010} \end{array} \\ \text{for fixed costs} & \end{aligned}$$

Cost effects of price recovery for fixed costs are as follows:

$$\text{Conversion costs: } (\$22 \text{ per unit} - 20 \text{ per unit}) \times 50,000 \text{ units} = \$100,000 \text{ U}$$

$$\text{Selling and cust.-service costs: } (\$25,000 \text{ per cust.} - \$24,000 \text{ per cust.}) \times 30 \text{ customers} = \$30,000 \text{ U}$$

In summary, the net increase in operating income attributable to price recovery equals the following:

Revenue effect of price recovery		\$420,000 F
Cost effect of price recovery		
Direct material costs	\$126,000 U	
Conversion costs	100,000 U	
Selling and customer-service costs	<u>30,000 U</u>	<u>256,000 U</u>
Change in operating income due to price recovery		<u>\$164,000 F</u>

Productivity Component of Operating-Income Change

$$\begin{aligned} \text{Cost effect of productivity for} &= \left(\begin{array}{c} \text{Actual units of} \\ \text{input used to produce} \\ \text{2011 output} \end{array} - \begin{array}{c} \text{Units of input} \\ \text{required to produce} \\ \text{2011 output in 2010} \end{array} \right) \times \begin{array}{c} \text{Input} \\ \text{price in} \\ \text{2011} \end{array} \\ \text{variable costs} & \end{aligned}$$

$$\begin{aligned} \text{Cost effect of productivity for} &= (123,000 \text{ sq. ft.} - 126,000 \text{ sq. ft.}) \times \$11 \text{ per sq. ft.} = \$33,000 \text{ F} \\ \text{direct materials} & \end{aligned}$$

$$\begin{aligned} \text{Cost effect of productivity for} &= \left(\begin{array}{c} \text{Actual units} \\ \text{of capacity} \\ \text{in 2011} \end{array} - \begin{array}{c} \text{Actual units of capacity in} \\ \text{2010, because adequate} \\ \text{capacity exists to produce} \\ \text{2011 output in 2010} \end{array} \right) \times \begin{array}{c} \text{Price per} \\ \text{unit of} \\ \text{capacity} \\ \text{in 2011} \end{array} \\ \text{fixed costs} & \end{aligned}$$

Cost effects of productivity for fixed costs are as follows:

$$\text{Conversion costs: } (50,000 \text{ units} - 50,000 \text{ units}) \times \$22 \text{ per unit} = \$0$$

$$\text{Selling and customer-service costs: } (29 \text{ customers} - 30 \text{ customers}) \times \$25,000/\text{customer} = \$25,000 \text{ F}$$

In summary, the net increase in operating income attributable to productivity equals the following:

Cost effect of productivity:	
Direct material costs	\$33,000 F
Conversion costs	0
Selling and customer-service costs	<u>25,000 F</u>
Change in operating income due to productivity	<u>\$58,000 F</u>

A summary of the change in operating income between 2010 and 2011 follows:

	Income Statement Amounts in 2010 (1)	Revenue and Cost Effects of Growth Component in 2011 (2)	Revenue and Cost Effects of Price-Recovery Component in 2011 (3)	Cost Effect of Productivity Component in 2011 (4)	Income Statement Amounts in 2011 (5) = (1) + (2) + (3) + (4)
Revenue	\$4,000,000	\$200,000 F	\$420,000 F	—	\$4,620,000
Costs	<u>2,920,000</u>	<u>60,000 U</u>	<u>256,000 U</u>	<u>\$58,000 F</u>	<u>3,178,000</u>
Operating income	<u>\$1,080,000</u>	<u>\$140,000 F</u>	<u>\$164,000 F</u>	<u>\$58,000 F</u>	<u>\$1,442,000</u>
			362,000 F		
	↑—————↑				
	Change in operating income				

3. Effect of the Industry-Market-Size Factor on Operating Income

Of the increase in sales from 40,000 to 42,000 units, 3%, or 1,200 units (0.03 × 40,000), is due to growth in market size, and 800 units (2,000 – 1,200) are due to an increase in market share. The change in Westwood's operating income from the industry-market-size factor rather than specific strategic actions is as follows:

$$\$140,000 \text{ (column 2 of preceding table)} \times \frac{1,200 \text{ units}}{2,000 \text{ units}} = \underline{\underline{\$84,000 \text{ F}}}$$

Effect of Product Differentiation on Operating Income

Increase in the selling price of KE8 (revenue effect of the price-recovery component)	\$420,000 F
Increase in prices of inputs (cost effect of the price-recovery component)	256,000 U
Growth in market share due to product differentiation	
$\$140,000 \text{ (column 2 of preceding table)} \times \frac{800 \text{ units}}{2,000 \text{ units}}$	<u>56,000 F</u>
Change in operating income due to product differentiation	<u>\$220,000 F</u>

Effect of Cost Leadership on Operating Income

Productivity component	<u>\$ 58,000 F</u>
------------------------	--------------------

A summary of the net increase in operating income from 2010 to 2011 follows:

Change due to the industry-market-size factor	\$ 84,000 F
Change due to product differentiation	220,000 F
Change due to cost leadership	<u>58,000 F</u>
Change in operating income	<u>\$362,000 F</u>

4. The analysis of operating income indicates that a significant amount of the increase in operating income resulted from Westwood's successful implementation of its product-differentiation strategy. The company was able to continue to charge a premium price for KE8 while increasing market share. Westwood was also able to earn additional operating income from improving its productivity.

Decision Points

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

Decision

Guidelines

1. What are two generic strategies a company can use?

Two generic strategies are product differentiation and cost leadership. Product differentiation is offering products and services that are perceived by customers as being superior and unique. Cost leadership is achieving low costs relative to competitors. A company chooses its strategy based on an understanding of customer preferences and its own internal capabilities, while differentiating itself from its competitors.
2. What is reengineering?

Reengineering is the rethinking of business processes, such as the order-delivery process, to improve critical performance measures such as cost, quality, and customer satisfaction.
3. How can an organization translate its strategy into a set of performance measures?

An organization can develop a balanced scorecard that provides the framework for a strategic measurement and management system. The balanced scorecard measures performance from four perspectives: (1) financial, (2) customer, (3) internal business processes, and (4) learning and growth. To build their balanced scorecards, organizations often create strategy maps to represent the cause-and-effect relationships across various strategic objectives.
4. How can a company analyze changes in operating income to evaluate the success of its strategy?

To evaluate the success of its strategy, a company can subdivide the change in operating income into growth, price-recovery, and productivity components. The growth component measures the change in revenues and costs from selling more or less units, assuming nothing else has changed. The price-recovery component measures changes in revenues and costs solely as a result of changes in the prices of outputs and inputs. The productivity component measures the decrease in costs from using fewer inputs, a better mix of inputs, and reducing capacity. If a company is successful in implementing its strategy, changes in components of operating income align closely with strategy.
5. How can a company identify and manage unused capacity?

A company must first distinguish engineered costs from discretionary costs. Engineered costs result from a cause-and-effect relationship between output and the resources needed to produce that output. Discretionary costs arise from periodic (usually annual) management decisions regarding the amount of cost to be incurred. Discretionary costs are not tied to a cause-and-effect relationship between inputs and outputs. Identifying unused capacity is easier for engineered costs and more difficult for discretionary costs. Downsizing is an approach to managing unused capacity that matches costs to the activities that need to be performed to operate effectively.

Appendix

Productivity Measurement

Productivity measures the relationship between actual inputs used (both quantities and costs) and actual outputs produced. The lower the inputs for a given quantity of outputs or the higher the outputs for a given quantity of inputs, the higher the productivity. Measuring productivity improvements over time highlights the specific input-output relationships that contribute to cost leadership.

Partial Productivity Measures

Partial productivity, the most frequently used productivity measure, compares the quantity of output produced with the quantity of an individual input used. In its most common form, partial productivity is expressed as a ratio:

$$\text{Partial productivity} = \frac{\text{Quantity of output produced}}{\text{Quantity of input used}}$$

The higher the ratio, the greater the productivity.

Consider direct materials productivity at Chipset in 2011.

$$\begin{aligned} \text{Direct materials} &= \frac{\text{Quantity of CX1 units produced during 2011}}{\text{Quantity of direct materials used to produce CX1 in 2011}} \\ \text{partial productivity} &= \frac{1,150,000 \text{ units of CX1}}{2,900,000 \text{ sq. cm. of direct materials}} \\ &= 0.397 \text{ units of CX1 per sq. cm. of direct materials} \end{aligned}$$

Note direct materials partial productivity ignores Chipset's other input, manufacturing conversion capacity. Partial-productivity measures become more meaningful when comparisons are made that examine productivity changes over time, either across different facilities or relative to a benchmark. Exhibit 13-6 presents partial-productivity measures for Chipset's inputs for 2011 and the comparable 2010 inputs that would have been used to produce 2011 output, using information from the productivity-component calculations on page 482. These measures compare actual inputs used in 2011 to produce 1,150,000 units of CX1 with inputs that would have been used in 2011 had the input-output relationship from 2010 continued in 2011.

Evaluating Changes in Partial Productivities

Note how the partial-productivity measures differ for variable-cost and fixed-cost components. For variable-cost elements, such as direct materials, productivity improvements measure the reduction in input resources used to produce output (3,450,000 square centimeters of silicon wafers to 2,900,000 square centimeters). For fixed-cost elements such as manufacturing conversion capacity, partial productivity measures the reduction in overall capacity from 2010 to 2011 (3,750,000 square centimeters of silicon wafers to 3,500,000 square centimeters) regardless of the amount of capacity actually used in each period.

An advantage of partial-productivity measures is that they focus on a single input. As a result, they are simple to calculate and easily understood by operations personnel. Managers and operators examine these numbers and try to understand the reasons for the productivity changes—such as, better training of workers, lower labor turnover, better incentives, improved methods, or substitution of materials for labor. Isolating the relevant factors helps Chipset implement and sustain these practices in the future.

For all their advantages, partial-productivity measures also have serious drawbacks. Because partial productivity focuses on only one input at a time rather than on all inputs simultaneously, managers cannot evaluate the effect on overall productivity, if (say) manufacturing-conversion-capacity partial productivity increases while direct materials partial productivity decreases. Total factor productivity (TFP), or total productivity, is a measure of productivity that considers all inputs simultaneously.

Exhibit 13-6

Comparing Chipset's Partial Productivities in 2010 and 2011

Input (1)	Partial Productivity in 2011 (2)	Comparable Partial Productivity Based on 2010 Input- Output Relationships (3)	Percentage Change from 2010 to 2011 (4)
Direct materials	$\frac{1,150,000}{2,900,000} = 0.397$	$\frac{1,150,000}{3,450,000} = 0.333$	$\frac{0.397 - 0.333}{0.333} = 19.2\%$
Manufacturing conversion capacity	$\frac{1,150,000}{3,500,000} = 0.329$	$\frac{1,150,000}{3,750,000} = 0.307$	$\frac{0.329 - 0.307}{0.307} = 7.2\%$

Total Factor Productivity

Total factor productivity (TFP) is the ratio of the quantity of output produced to the costs of all inputs used based on current-period prices.

$$\text{Total factor productivity} = \frac{\text{Quantity of output produced}}{\text{Costs of all inputs used}}$$

TFP considers all inputs simultaneously and the trade-offs across inputs based on current input prices. Do not think of all productivity measures as physical measures lacking financial content—how many units of output are produced per unit of input. TFP is intricately tied to minimizing total cost—a financial objective.

Calculating and Comparing Total Factor Productivity

We first calculate Chipset's TFP in 2011, using 2011 prices and 1,150,000 units of output produced (based on information from the first part of the productivity-component calculations on p. 482).

$$\begin{aligned} \text{Total factor productivity} &= \frac{\text{Quantity of output produced in 2011}}{\text{Costs of inputs used in 2011 based on 2011 prices}} \\ \text{for 2011 using 2011 prices} &= \frac{1,150,000}{(2,900,000 \times \$1.50) + (3,500,000 \times \$4.35)} \\ &= \frac{1,150,000}{\$19,575,000} \\ &= 0.058748 \text{ units of output per dollar of input cost} \end{aligned}$$

By itself, the 2011 TFP of 0.058748 units of CX1 per dollar of input costs is not particularly helpful. We need something to compare the 2011 TFP against. One alternative is to compare TFPs of other similar companies in 2011. However, finding similar companies and obtaining accurate comparable data are often difficult. Companies, therefore, usually compare their own TFPs over time. In the Chipset example, we use as a benchmark TFP calculated using the inputs that Chipset would have used in 2010 to produce 1,150,000 units of CX1 at 2011 prices (that is, we use the costs calculated from the second part of the productivity-component calculations on p. 482). Why do we use 2011 prices? Because using the current year's prices in both calculations controls for input-price differences and focuses the analysis on adjustments the manager made in quantities of inputs in response to changes in prices.

$$\begin{aligned} \text{Benchmark} &= \frac{\text{Quantity of output produced in 2011}}{\text{Costs of inputs at 2011 prices that would have been used in 2010}} \\ \text{TFP} &= \frac{1,150,000}{(3,450,000 \times \$1.50) + (3,750,000 \times \$4.35)} \\ &= \frac{1,150,000}{\$21,487,500} \\ &= 0.053519 \text{ units of output per dollar of input cost} \end{aligned}$$

Using 2011 prices, TFP increased 9.8% $[(0.058748 - 0.053519) \div 0.053519 = 0.098, \text{ or } 9.8\%]$ from 2010 to 2011. Note that the 9.8% increase in TFP also equals the \$1,912,500 gain (Exhibit 13-5, column 4) divided by the \$19,575,000 of actual costs incurred in 2011 (Exhibit 13-5, column 5). Total factor productivity increased because Chipset produced more output per dollar of input cost in 2011 relative to 2010, measured in both years using 2011 prices. The gain in TFP occurs because Chipset increases the partial productivities of individual inputs and, consistent with its strategy, combines inputs to lower costs. Note that increases in TFP cannot be due to differences in input prices because we used 2011 prices to evaluate both the inputs that Chipset would have used in 2010 to produce 1,150,000 units of CX1 and the inputs actually used in 2011.

Using Partial and Total Factor Productivity Measures

A major advantage of TFP is that it measures the combined productivity of all inputs used to produce output and explicitly considers gains from using fewer physical inputs as well as substitution among inputs. Managers can analyze these numbers to understand the reasons for changes in TFP—for example, better human resource management practices, higher quality of materials, or improved manufacturing methods.

Although TFP measures are comprehensive, operations personnel find financial TFP measures more difficult to understand and less useful than physical partial-productivity measures. For example, companies that are more labor intensive than Chipset use manufacturing-labor partial-productivity measures. However, if productivity-based bonuses depend on gains in manufacturing-labor partial productivity alone, workers have incentives to substitute materials (and capital) for labor. This substitution improves their own productivity measure, while possibly decreasing the overall productivity of the company as measured by TFP. To overcome these incentive problems, some companies—for example, TRW, Eaton, and Whirlpool—explicitly adjust bonuses based on manufacturing-labor partial productivity for the effects of other factors such as investments in new equipment and higher levels of scrap. That is, they combine partial productivity with TFP-like measures.

Many companies such as Behlen Manufacturing, a steel fabricator, and Dell Computers use both partial productivity and total factor productivity to evaluate performance. *Partial productivity and TFP measures work best together because the strengths of one offset the weaknesses of the other.*

Terms to Learn

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

balanced scorecard (p. 470)	partial productivity (p. 493)	reengineering (p. 469)
cost leadership (p. 468)	price-recovery component (p. 479)	rightsizing (p. 487)
discretionary costs (p. 486)	product differentiation (p. 468)	strategy map (p. 471)
downsizing (p. 487)	productivity (p. 492)	total factor productivity (TFP) (p. 494)
engineered costs (p. 486)	productivity component (p. 479)	unused capacity (p. 486)
growth component (p. 479)		

Assignment Material

Questions



- 13-1** Define strategy.
- 13-2** Describe the five key forces to consider when analyzing an industry.
- 13-3** Describe two generic strategies.
- 13-4** What is a customer preference map and why is it useful?
- 13-5** What is reengineering?
- 13-6** What are four key perspectives in the balanced scorecard?
- 13-7** What is a strategy map?
- 13-8** Describe three features of a good balanced scorecard.
- 13-9** What are three important pitfalls to avoid when implementing a balanced scorecard?
- 13-10** Describe three key components in doing a strategic analysis of operating income.
- 13-11** Why might an analyst incorporate the industry-market-size factor and the interrelationships among the growth, price-recovery, and productivity components into a strategic analysis of operating income?
- 13-12** How does an engineered cost differ from a discretionary cost?
- 13-13** What is downsizing?
- 13-14** What is a partial-productivity measure?
- 13-15** “We are already measuring total factor productivity. Measuring partial productivities would be of no value.” Do you agree? Comment briefly.

Exercises



13-16 Balanced scorecard. Ridgecrest Corporation manufactures corrugated cardboard boxes. It competes and plans to grow by selling high-quality boxes at a low price and by delivering them to customers quickly after receiving customers’ orders. There are many other manufacturers who produce similar boxes. Ridgecrest believes that continuously improving its manufacturing processes and having satisfied employees are critical to implementing its strategy in 2012.

- Is Ridgecrest’s 2012 strategy one of product differentiation or cost leadership? Explain briefly.
- Kearney Corporation, a competitor of Ridgecrest, manufactures corrugated boxes with more designs and color combinations than Ridgecrest at a higher price. Kearney’s boxes are of high quality but require more time to produce and so have longer delivery times. Draw a simple customer preference map as in Exhibit 13-1 for Ridgecrest and Kearney using the attributes of price, delivery time, quality, and design.

Required

3. Draw a strategy map as in Exhibit 13-2 with two strategic objectives you would expect to see under each balanced scorecard perspective.
4. For each strategic objective indicate a measure you would expect to see in Ridgecrest's balanced scorecard for 2012.

13-17 Analysis of growth, price-recovery, and productivity components (continuation of 13-16). An analysis of Ridgecrest's operating-income changes between 2011 and 2012 shows the following:

Operating income for 2011	\$1,850,000
Add growth component	85,000
Deduct price-recovery component	(72,000)
Add productivity component	<u>150,000</u>
Operating income for 2012	<u>\$2,013,000</u>

The industry market size for corrugated cardboard boxes did not grow in 2012, input prices did not change, and Ridgecrest reduced the prices of its boxes.

Required

1. Was Ridgecrest's gain in operating income in 2012 consistent with the strategy you identified in requirement 1 of Exercise 13-16?
2. Explain the productivity component. In general, does it represent savings in only variable costs, only fixed costs, or both variable and fixed costs?

13-18 Strategy, balanced scorecard, merchandising operation. Roberto & Sons buys T-shirts in bulk, applies its own trendsetting silk-screen designs, and then sells the T-shirts to a number of retailers. Roberto wants to be known for its trendsetting designs, and it wants every teenager to be seen in a distinctive Roberto T-shirt. Roberto presents the following data for its first two years of operations, 2010 and 2011.

	2010	2011
1 Number of T-shirts purchased	200,000	250,000
2 Number of T-shirts discarded	2,000	3,300
3 Number of T-shirts sold (row 1 – row 2)	198,000	246,700
4 Average selling price	\$25.00	\$26.00
5 Average cost per T-shirt	\$10.00	\$8.50
6 Administrative capacity (number of customers)	4,000	3,750
7 Administrative costs	\$1,200,000	\$1,162,500
8 Administrative cost per customer (row 7 ÷ row 6)	\$300	\$310

Administrative costs depend on the number of customers that Roberto has created capacity to support, not on the actual number of customers served. Roberto had 3,600 customers in 2010 and 3,500 customers in 2011.

Required

1. Is Roberto's strategy one of product differentiation or cost leadership? Explain briefly.
2. Describe briefly the key measures Roberto should include in its balanced scorecard and the reasons it should do so.

13-19 Strategic analysis of operating income (continuation of 13-18). Refer to Exercise 13-18.

Required

1. Calculate Roberto's operating income in both 2010 and 2011.
2. Calculate the growth, price-recovery, and productivity components that explain the change in operating income from 2010 to 2011.
3. Comment on your answers in requirement 2. What does each of these components indicate?

13-20 Analysis of growth, price-recovery, and productivity components (continuation of 13-19). Refer to Exercise 13-19. Suppose that the market for silk-screened T-shirts grew by 10% during 2011. All increases in sales greater than 10% are the result of Roberto's strategic actions.

Required

Calculate the change in operating income from 2010 to 2011 due to growth in market size, product differentiation, and cost leadership. How successful has Roberto been in implementing its strategy? Explain.

13-21 Identifying and managing unused capacity (continuation of 13-18). Refer to Exercise 13-18.

Required

1. Calculate the amount and cost of unused administrative capacity at the beginning of 2011, based on the actual number of customers Roberto served in 2011.
2. Suppose Roberto can only add or reduce administrative capacity in increments of 250 customers. What is the maximum amount of costs that Roberto can save in 2011 by downsizing administrative capacity?
3. What factors, other than cost, should Roberto consider before it downsizes administrative capacity?

13-22 Strategy, balanced scorecard. Stanmore Corporation makes a special-purpose machine, D4H, used in the textile industry. Stanmore has designed the D4H machine for 2011 to be distinct from its competitors. It has been generally regarded as a superior machine. Stanmore presents the following data for 2010 and 2011.

	2010	2011
1. Units of D4H produced and sold	200	210
2. Selling price	\$40,000	\$42,000
3. Direct materials (kilograms)	300,000	310,000
4. Direct material cost per kilogram	\$8	\$8.50
5. Manufacturing capacity in units of D4H	250	250
6. Total conversion costs	\$2,000,000	\$2,025,000
7. Conversion cost per unit of capacity (row 6 ÷ row 5)	\$8,000	\$8,100
8. Selling and customer-service capacity	100 customers	95 customers
9. Total selling and customer-service costs	\$1,000,000	\$940,500
10. Selling and customer-service capacity cost per customer (row 9 ÷ row 8)	\$10,000	\$9,900

Stanmore produces no defective machines, but it wants to reduce direct materials usage per D4H machine in 2011. Conversion costs in each year depend on production capacity defined in terms of D4H units that can be produced, not the actual units produced. Selling and customer-service costs depend on the number of customers that Stanmore can support, not the actual number of customers it serves. Stanmore has 75 customers in 2010 and 80 customers in 2011.

1. Is Stanmore's strategy one of product differentiation or cost leadership? Explain briefly.
2. Describe briefly key measures that you would include in Stanmore's balanced scorecard and the reasons for doing so.

Required

13-23 Strategic analysis of operating income (continuation of 13-22). Refer to Exercise 13-22.

1. Calculate the operating income of Stanmore Corporation in 2010 and 2011.
2. Calculate the growth, price-recovery, and productivity components that explain the change in operating income from 2010 to 2011.
3. Comment on your answer in requirement 2. What do these components indicate?

Required

13-24 Analysis of growth, price-recovery, and productivity components (continuation of 13-23).

Suppose that during 2011, the market for Stanmore's special-purpose machines grew by 3%. All increases in market share (that is, sales increases greater than 3%) are the result of Stanmore's strategic actions.

Calculate how much of the change in operating income from 2010 to 2011 is due to the industry-market-size factor, product differentiation, and cost leadership. How successful has Stanmore been in implementing its strategy? Explain.

Required

13-25 Identifying and managing unused capacity (continuation of 13-22). Refer to Exercise 13-22.

1. Calculate the amount and cost of (a) unused manufacturing capacity and (b) unused selling and customer-service capacity at the beginning of 2011 based on actual production and actual number of customers served in 2011.
2. Suppose Stanmore can add or reduce its manufacturing capacity in increments of 30 units. What is the maximum amount of costs that Stanmore could save in 2011 by downsizing manufacturing capacity?
3. Stanmore, in fact, does not eliminate any of its unused manufacturing capacity. Why might Stanmore not downsize?

Required

13-26 Strategy, balanced scorecard, service company. Westlake Corporation is a small information-systems consulting firm that specializes in helping companies implement standard sales-management software. The market for Westlake's services is very competitive. To compete successfully, Westlake must deliver quality service at a low cost. Westlake presents the following data for 2010 and 2011.

	2010	2011
1. Number of jobs billed	60	70
2. Selling price per job	\$50,000	\$48,000
3. Software-implementation labor-hours	30,000	32,000
4. Cost per software-implementation labor-hour	\$60	\$63
5. Software-implementation support capacity (number of jobs it can do)	90	90
6. Total cost of software-implementation support	\$360,000	\$369,000
7. Software-implementation support-capacity cost per job (row 6 ÷ row 5)	\$4,000	\$4,100

Software-implementation labor-hour costs are variable costs. Software-implementation support costs for each year depend on the software-implementation support capacity Westlake chooses to maintain each year (that is the number of jobs it can do each year). It does not vary with the actual number of jobs done that year.

Required

1. Is Westlake Corporation's strategy one of product differentiation or cost leadership? Explain briefly.
2. Describe key measures you would include in Westlake's balanced scorecard and your reasons for doing so.

13-27 Strategic analysis of operating income (continuation of 13-26). Refer to Exercise 13-26.

Required

1. Calculate the operating income of Westlake Corporation in 2010 and 2011.
2. Calculate the growth, price-recovery, and productivity components that explain the change in operating income from 2010 to 2011.
3. Comment on your answer in requirement 2. What do these components indicate?

13-28 Analysis of growth, price-recovery, and productivity components (continuation of 13-27). Suppose that during 2011 the market for implementing sales-management software increases by 5%. Assume that any decrease in selling price and any increase in market share more than 5% are the result of strategic choices by Westlake's management to implement its strategy.

Required

Calculate how much of the change in operating income from 2010 to 2011 is due to the industry-market-size factor, product differentiation, and cost leadership. How successful has Westlake been in implementing its strategy? Explain.

13-29 Identifying and managing unused capacity (continuation of 13-26). Refer to Exercise 13-26.

Required

1. Calculate the amount and cost of unused software-implementation support capacity at the beginning of 2011, based on the number of jobs actually done in 2011.
2. Suppose Westlake can add or reduce its software-implementation support capacity in increments of 15 units. What is the maximum amount of costs that Westlake could save in 2011 by downsizing software-implementation support capacity?
3. Westlake, in fact, does not eliminate any of its unused software-implementation support capacity. Why might Westlake not downsize?



Problems

13-30 Balanced scorecard and strategy. Music Master Company manufactures an MP3 player called the Mini. The company sells the player to discount stores throughout the country. This player is significantly less expensive than similar products sold by Music Master's competitors, but the Mini offers just four gigabytes of space, compared with eight offered by competitor Vantage Manufacturing. Furthermore, the Mini has experienced production problems that have resulted in significant rework costs. Vantage's model has an excellent reputation for quality, but is considerably more expensive.

Required

1. Draw a simple customer preference map for Music Master and Vantage using the attributes of price, quality, and storage capacity. Use the format of Exhibit 13-1.
2. Is Music Master's current strategy that of product differentiation or cost leadership?
3. Music Master would like to improve quality and decrease costs by improving processes and training workers to reduce rework. Music Master's managers believe the increased quality will increase sales. Draw a strategy map as in Exhibit 13-2 describing the cause-and-effect relationships among the strategic objectives you would expect to see in Music Master's balanced scorecard.
4. For each strategic objective suggest a measure you would recommend in Music Master's balanced scorecard.

13-31 Strategic analysis of operating income (continuation of 13-30). Refer to Problem 13-30. As a result of the actions taken, quality has significantly improved in 2011 while rework and unit costs of the Mini have decreased. Music Master has reduced manufacturing capacity because capacity is no longer needed to support rework. Music Master has also lowered the Mini's selling price to gain market share and unit sales have increased. Information about the current period (2011) and last period (2010) follows:

	2010	2011
1. Units of Mini produced and sold	8,000	9,000
2. Selling price	\$45	\$43
3. Ounces of direct materials used	32,000	33,000
4. Direct material cost per ounce	\$3.50	\$3.50
5. Manufacturing capacity in units	12,000	11,000
6. Total conversion costs	\$156,000	\$143,000
7. Conversion cost per unit of capacity (row 6 ÷ row 5)	\$13	\$13
8. Selling and customer-service capacity	90 customers	90 customers
9. Total selling and customer-service costs	\$45,000	\$49,500
10. Selling and customer-service capacity cost per customer (row 9 ÷ row 8)	\$500	\$550

Conversion costs in each year depend on production capacity defined in terms of units of Mini that can be produced, not the actual units produced. Selling and customer-service costs depend on the number of customers that Music Master can support, not the actual number of customers it serves. Music Master has 70 customers in 2010 and 80 customers in 2011.

1. Calculate operating income of Music Master Company for 2010 and 2011.
2. Calculate the growth, price-recovery, and productivity components that explain the change in operating income from 2010 to 2011.
3. Comment on your answer in requirement 2. What do these components indicate?

Required

13-32 Analysis of growth, price-recovery, and productivity components (continuation of 13-31). Suppose that during 2011, the market for MP3 players grew 3%. All decreases in the selling price of the Mini and increases in market share (that is, sales increases greater than 3%) are the result of Music Master’s strategic actions.

Calculate how much of the change in operating income from 2010 to 2011 is due to the industry-market-size factor, product differentiation, and cost leadership. How does this relate to Music Master’s strategy and its success in implementation? Explain.

Required

13-33 Identifying and managing unused capacity (continuation of 13-31) Refer to the information for Music Master Company in 13-31.

1. Calculate the amount and cost of (a) unused manufacturing capacity and (b) unused selling and customer-service capacity at the beginning of 2011 based on actual production and actual number of customers served in 2011.
2. Suppose Music Master can add or reduce its selling and customer-service capacity in increments of five customers. What is the maximum amount of costs that Music Master could save in 2011 by downsizing selling and customer-service capacity?
3. Music Master, in fact, does not eliminate any of its unused selling and customer-service capacity. Why might Music Master not downsize?

Required

13-34 Balanced scorecard. Following is a random-order listing of perspectives, strategic objectives, and performance measures for the balanced scorecard.

Perspectives	Performance Measures
Internal business process	Percentage of defective-product units
Customer	Return on assets
Learning and growth	Number of patents
Financial	Employee turnover rate
Strategic Objectives	Net income
Acquire new customers	Customer profitability
Increase shareholder value	Percentage of processes with real-time feedback
Retain customers	Return on sales
Improve manufacturing quality	Average job-related training-hours per employee
Develop profitable customers	Return on equity
Increase proprietary products	Percentage of on-time deliveries by suppliers
Increase information-system capabilities	Product cost per unit
Enhance employee skills	Profit per salesperson
On-time delivery by suppliers	Percentage of error-free invoices
Increase profit generated by each salesperson	Customer cost per unit
Introduce new products	Earnings per share
Minimize invoice-error rate	Number of new customers
	Percentage of customers retained

For each perspective, select those strategic objectives from the list that best relate to it. For each strategic objective, select the most appropriate performance measure(s) from the list.

Required

13-35 Balanced scorecard. (R. Kaplan, adapted) Caltex, Inc., refines gasoline and sells it through its own Caltex Gas Stations. On the basis of market research, Caltex determines that 60% of the overall gasoline market consists of “service-oriented customers,” medium- to high-income individuals who are willing to pay a higher price for gas if the gas stations can provide excellent customer service, such as a clean facility, a convenience store, friendly employees, a quick turnaround, the ability to pay by credit card, and high-octane premium gasoline. The remaining 40% of the overall market are “price shoppers” who look to buy the cheapest gasoline available. Caltex’s strategy is to focus on the 60% of service-oriented

customers. Caltex's balanced scorecard for 2011 follows. For brevity, the initiatives taken under each objective are omitted.

Objectives	Measures	Target Performance	Actual Performance
Financial Perspective			
Increase shareholder value	Operating-income changes from price recovery	\$90,000,000	\$95,000,000
	Operating-income changes from growth	\$65,000,000	\$67,000,000
Customer Perspective			
Increase market share	Market share of overall gasoline market	10%	9.8%
Internal-Business-Process Perspective			
Improve gasoline quality	Quality index	94 points	95 points
Improve refinery performance	Refinery-reliability index (%)	91%	91%
Ensure gasoline availability	Product-availability index (%)	99%	100%
Learning-and-Growth Perspective			
Increase refinery process capability	Percentage of refinery processes with advanced controls	88%	90%

Required

1. Was Caltex successful in implementing its strategy in 2011? Explain your answer.
2. Would you have included some measure of employee satisfaction and employee training in the learning-and-growth perspective? Are these objectives critical to Caltex for implementing its strategy? Why or why not? Explain briefly.
3. Explain how Caltex did not achieve its target market share in the total gasoline market but still exceeded its financial targets. Is "market share of overall gasoline market" the correct measure of market share? Explain briefly.
4. Is there a cause-and-effect linkage between improvements in the measures in the internal business-process perspective and the measure in the customer perspective? That is, would you add other measures to the internal-business-process perspective or the customer perspective? Why or why not? Explain briefly.
5. Do you agree with Caltex's decision not to include measures of changes in operating income from productivity improvements under the financial perspective of the balanced scorecard? Explain briefly.

13-36 Balanced scorecard. Lee Corporation manufactures various types of color laser printers in a highly automated facility with high fixed costs. The market for laser printers is competitive. The various color laser printers on the market are comparable in terms of features and price. Lee believes that satisfying customers with products of high quality at low costs is key to achieving its target profitability. For 2011, Lee plans to achieve higher quality and lower costs by improving yields and reducing defects in its manufacturing operations. Lee will train workers and encourage and empower them to take the necessary actions. Currently, a significant amount of Lee's capacity is used to produce products that are defective and cannot be sold. Lee expects that higher yields will reduce the capacity that Lee needs to manufacture products. Lee does not anticipate that improving manufacturing will automatically lead to lower costs because Lee has high fixed costs. To reduce fixed costs per unit, Lee could lay off employees and sell equipment, or it could use the capacity to produce and sell more of its current products or improved models of its current products.

Lee's balanced scorecard (initiatives omitted) for the just-completed fiscal year 2011 follows:

Objectives	Measures	Target Performance	Actual Performance
Financial Perspective			
Increase shareholder value	Operating-income changes from productivity improvements	\$1,000,000	\$400,000
	Operating-income changes from growth	\$1,500,000	\$600,000
Customer Perspective			
Increase market share	Market share in color laser printers	5%	4.6%
Internal-Business-Process Perspective			
Improve manufacturing quality	Yield	82%	85%
Reduce delivery time to customers	Order-delivery time	25 days	22 days
Learning-and-Growth Perspective			
Develop process skills	Percentage of employees trained in process and quality management	90%	92%
Enhance information-system capabilities	Percentage of manufacturing processes with real-time feedback	85%	87%

1. Was Lee successful in implementing its strategy in 2011? Explain.
2. Is Lee's balanced scorecard useful in helping the company understand why it did not reach its target market share in 2011? If it is, explain why. If it is not, explain what other measures you might want to add under the customer perspective and why.
3. Would you have included some measure of employee satisfaction in the learning-and-growth perspective and new-product development in the internal-business-process perspective? That is, do you think employee satisfaction and development of new products are critical for Lee to implement its strategy? Why or why not? Explain briefly.
4. What problems, if any, do you see in Lee improving quality and significantly downsizing to eliminate unused capacity?

Required

13-37 Partial productivity measurement. Gerhart Company manufactures wallets from fabric. In 2011, Gerhart made 2,520,000 wallets using 2,000,000 yards of fabric. In 2011, Gerhart has capacity to make 3,307,500 wallets and incurs a cost of \$9,922,500 for this capacity. In 2012, Gerhart plans to make 2,646,000 wallets, make fabric use more efficient, and reduce capacity.

Suppose that in 2012 Gerhart makes 2,646,000 wallets, uses 1,764,000 yards of fabric, and reduces capacity to 2,700,000 wallets, incurring a cost of \$8,370,000 for this capacity.

1. Calculate the partial-productivity ratios for materials and conversion (capacity costs) for 2012, and compare them to a benchmark for 2011 calculated based on 2012 output.
2. How can Gerhart Company use the information from the partial-productivity calculations?

Required

13-38 Total factor productivity (continuation of 13-37). Refer to the data for Problem 13-37. Assume the fabric costs \$3.70 per yard in 2012 and \$3.85 per yard in 2011.

1. Compute Gerhart Company's total factor productivity (TFP) for 2012.
2. Compare TFP for 2012 with a benchmark TFP for 2011 inputs based on 2012 prices and output.
3. What additional information does TFP provide that partial productivity measures do not?

Required

Collaborative Learning Problem

13-39 Strategic analysis of operating income. Halsey Company sells women's clothing. Halsey's strategy is to offer a wide selection of clothes and excellent customer service and to charge a premium price. Halsey presents the following data for 2010 and 2011. For simplicity, assume that each customer purchases one piece of clothing.

	2010	2011
1. Pieces of clothing purchased and sold	40,000	40,000
2. Average selling price	\$60	\$59
3. Average cost per piece of clothing	\$40	\$41
4. Selling and customer-service capacity	51,000 customers	43,000 customers
5. Selling and customer-service costs	\$357,000	\$296,700
6. Selling and customer-service capacity cost per customer (row 5 ÷ row 4)	\$7 per customer	\$6.90 per customer
7. Purchasing and administrative capacity	980 designs	850 designs
8. Purchasing and administrative costs	\$245,000	\$204,000
9. Purchasing and administrative capacity cost per distinct design (row 8 ÷ row 7)	\$250 per design	\$240 per design

Total selling and customer-service costs depend on the number of customers that Halsey has created capacity to support, not the actual number of customers that Halsey serves. Total purchasing and administrative costs depend on purchasing and administrative capacity that Halsey has created (defined in terms of the number of distinct clothing designs that Halsey can purchase and administer). Purchasing and administrative costs do not depend on the actual number of distinct clothing designs purchased. Halsey purchased 930 distinct designs in 2010 and 820 distinct designs in 2011.

At the start of 2010, Halsey planned to increase operating income by 10% over operating income in 2011.

1. Is Halsey's strategy one of product differentiation or cost leadership? Explain.
2. Calculate Halsey's operating income in 2010 and 2011.
3. Calculate the growth, price-recovery, and productivity components of changes in operating income between 2010 and 2011.
4. Does the strategic analysis of operating income indicate Halsey was successful in implementing its strategy in 2011? Explain.

Required