

# Chapter

# 1

## Business Strategy Context for Operations Strategy<sup>1</sup>

Footnote 1

### Introduction

Exhibit 1.1

Axcelis Technologies, Inc., a 2000 spin-off of Eaton Corporation, is a \$365 million producer of ion implantation equipment used in the fabrication of semiconductors. Its business, as that of others in the semiconductor equipment industry, fluctuates significantly from year to year as the fortunes of the semiconductor industry and its customers in the electronics industry wax and wane. While the growth rate of the electronics industry overall fluctuates between negative 10% and plus 30% annually, growth rates in the semiconductor equipment sector fluctuate from negative 30% to plus 80% (Exhibit 1.1).

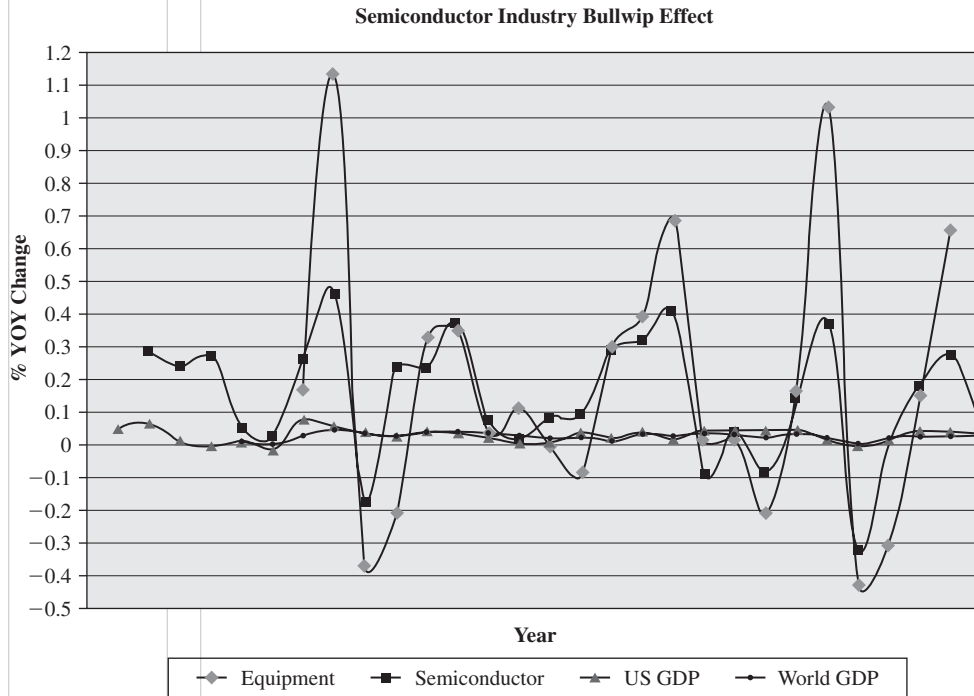
As a result of these regular fluctuations, Axcelis must adopt a strategy that allows it to react efficiently to business conditions, while still retaining an edge in providing the latest technological solutions to its customers. Its business strategy—to be innovative and flexible in response to industry demands—builds on three key elements: technology leadership, operational excellence, and customer partnerships. This strategy, in turn, guides the key decisions constituting Axcelis' operations strategy.

- Axcelis limits its *vertical integration* to those activities that are critical to the final assembly and test of its complex and technical equipment, thus minimizing its investment in fixed capacity. This allows Axcelis to deliver on its technology promise, as it maintains key technological equipment and knowledge—the basis of its key capabilities—in house. At the same time, it can suffer declines in demand without having to cover significant fixed costs. Its suppliers, in turn, aggregate demand across multiple customers, thus smoothing requirements for their own fixed assets.
- Given its vertical integration strategy, Axcelis selectively invests in *process technology* to improve the organization of the workflow on its factory floor and the integration of its suppliers into the factory floor. While the growth rates in GDP have changed only modestly

<sup>1</sup> We are grateful to Rob Mosher, Jim Duda, Chris Ogden, and Earl Jones, Leaders for Manufacturing graduates, for their thoughtful integration of many concepts in the business and operations strategy literature. We have used much of their work in writing this chapter.

### EXHIBIT 1.1 Growth Rate Fluctuations in the Semiconductor Industry

Data drawn from Semiconductor Industry Association. *2002 Annual Databook, Review of Global and US Semiconductor Competitive Trends 1978–2001*, pp. 6, 7, and 39 and online sources <http://www.globalfinancialdata.com>, <http://www.eia.doe.gov/>, <http://www.sia-online.org>, and [http://wps2a.semi.org/wps/portal/\\_pagr/135/\\_pa.135/679](http://wps2a.semi.org/wps/portal/_pagr/135/_pa.135/679), June 18, 2006.



over the years, growth rates in the semiconductor industry have varied from 10 to 50% and growth rates in the semiconductor equipment sector have changed as much as 100%.

- *Capacity* management is critical to Axcelis as it tracks the ups and downs of the business cycle. Attention to forecasting future trends in the industry allows Axcelis to work with limited space and labor buffers, thus maximizing its ability to respond to changes in demand at the lowest possible cost.
- Axcelis focuses its *facilities* on specific product lines or geographic regions. Its two U.S.-based plants focus on different product lines, while its Japan-based plant services the Asia-Pacific region. This allows Axcelis to develop focused technology expertise at each facility and provide local access to its large customers and markets.
- As Axcelis increases the amount of its business that it outsources and extends its geographic reach, it fine-tunes its *sourcing* policies to manage an increasingly wide range of suppliers. It segments its suppliers and defines different operational strategies for dealing with each segment. It strives to integrate its suppliers with its lean manufacturing agenda to maintain operational excellence.
- Axcelis carefully manages its *business processes and policies* for product and service generation, order fulfillment, and service and support to efficiently and effectively bring new technology solutions to the market and deliver them to customers as promised. The

highly technical nature of Axcelis' equipment forces it to tightly integrate product development with manufacturing process development to ensure that new products can actually be built.

- Not only does Axcelis strive to integrate its internal activities through a business process focus, but it also works closely with suppliers to streamline its *supply chain* allowing it to, for example, ship direct to customers from supplier sites where possible.
- Axcelis' investments in *information technology* focus on integration across the supply chain, including tools for customers to order and configure the complex products Axcelis offers, and tools for managing spare parts service and inventory. Such information technology investments support both the quest for operational excellence, and closer customer partnerships.
- Finally, Axcelis directs much of its effort to the development of *organizationwide capabilities* in lean manufacturing, quality management, and flexibility. The techniques it employs include work cells on the shop floor, six-sigma quality programs, and cycle time reduction.

Axcelis makes decisions in each of these areas in an integrated way, so the decisions support each other and the overall business strategy. Its choice to outsource, which reduces its degree of *vertical integration*, works only because of increased attention to *sourcing* management and tighter relationships with suppliers. Managing *capacity* to follow the ups and downs of the industry requires that Axcelis' *business processes and policies* support use of contract workers and overtime to grow and shrink the workforce as needed while still allowing Axcelis to retain critical technical knowledge. The focus of its *organization-wide capabilities development* on lean manufacturing has implications for most of the decision categories including *supply chain coordination* that streamlines the flow of parts and materials to Axcelis.

Over the years, Axcelis fine-tuned both its business and operations strategies as it developed within the Eaton Corporation and was subsequently spun out. In doing so, it had to answer the following questions:

- What businesses are we in?
- How will we gain competitive advantage in each of those businesses?
  - What market segment(s) do we wish to serve?
  - How will we satisfy our customers with respect to the cost, quality, availability, features/innovativeness, and environmental performance of our product and/or service families in each of those segments?
  - How will we work with our partners (customer, suppliers, competitors, those who offer complementary products and service, and others) to collectively satisfy our customers' needs?
  - What are our capabilities? How should we leverage the capabilities we have? What capabilities should we develop?
- How do our operations need to be structured to create competitive advantage? Specifically, what choices do we make with respect to
  - Vertical integration
  - Process technology

- Capacity
  - Facilities
  - Sourcing
  - Business processes and policies
  - Supply chain coordination
  - Information technology
  - Organizationwide capabilities
- How will the decisions we make about operations fit with decisions made in the other functional areas—marketing, research and development, finance and accounting, human resources—to synergistically create competitive advantage?

This book addresses these questions. Chapter 1 defines what we mean by strategy and how it is made, describes the corporate and business context in which operations strategy is made, and briefly introduces the areas of operations strategy that will be covered in this book.

## What Is Strategy?

Strategic thinking has its origins in the strategy of war and is defined formally as “1: an elaborate and systematic plan of action [syn: scheme] 2: the branch of military science dealing with military command and the planning and conduct of a war.” In the same context, tactics are defined as “the branch of military science dealing with detailed maneuvers to achieve objectives set by strategy” (Dictionary.com).

The earliest known writings on strategy are over 2,000 years old. Sun Tzu (2003), who wrote around 400 B.C. and whose book *The Art of War* was first translated from Chinese around 1910, captured critical strategic ploys such as what is known today as *first mover advantage*: “Generally, he who occupies the field of battle first and awaits his enemy is at ease; he who comes later to the scene and rushes into the fight is weary” (Mintzberg et al., 1998, p. 86). Carl von Clausewitz, who lived from 1780 to 1831 and whose book *On War* was first published in 1832, captured much of what we think about in strategy-making today when he argued that:

[S]trategy depends on basic building blocks, which are used in attack, defense, and maneuver. Strategy making relies on finding and executing new combinations of these blocks. In every age, technology and social organization limit the combinations. After some time, these limits seem inevitable and hence natural. Strategists cease to question received wisdom and confine themselves to variations on accepted themes. It is therefore left to the great commanders, such as Napoleon, to innovate strategically by recognizing and bringing about new combinations” (Mintzberg et al., 1998, pp. 88–89).

That this view from 200 years ago is still relevant today is evident in recent work showing that companies seeking “blue oceans,” or untapped market spaces outside the traditional bounds of their industry, in which to compete outperform those that stay within those bounds (Kim and Mauborgne 2005). In other words, the “great commanders” still succeed by questioning the rules of the game and finding new ways to play. Early writings by Sun Tzu and von Clausewitz have been highly influential on both the theory and practice of strategy, which to this day reflect a significant military flavor.

Over the years, strategy-thought leaders adapted these military definitions to fit business environments where the battles were fought among competing firms:

What business strategy is all about—what distinguishes it from all other kinds of business planning—is, in a word, competitive advantage. Without competitors there would be no need for strategy, for the sole purpose of strategic planning is to enable a company to gain, as efficiently as possible, a sustainable edge over its competitors. Corporate strategy thus implies an attempt to alter a company's strength relative to that of its competitors in the most efficient way (Ohmae 1982, p. 36).

Today, there is a considerable body of academic and practitioner literature on strategy—both its content and the process of making it—and two points of view have emerged as most prominent.

The first, the field of competitive strategy, grew largely out of the military strategy literature and focuses on positioning a firm in the right way within the right industry. The second, the resource-based view of the firm, focuses on the capabilities of the firm and how those capabilities can be leveraged to obtain competitive advantage. We examine both in some detail before integrating them into the strategy-making framework we will use in this book.

## Competitive Strategy: The Positioning View

The key concepts of the competitive strategy paradigm evolved directly from early military-based thinking and formed the basis of strategy teaching, research, and practice for over 20 years. The underlying premise of competitive strategy is that there are good industries and bad industries in which to play, and that one should seek to become a dominant player in a good industry (Porter, 1980).

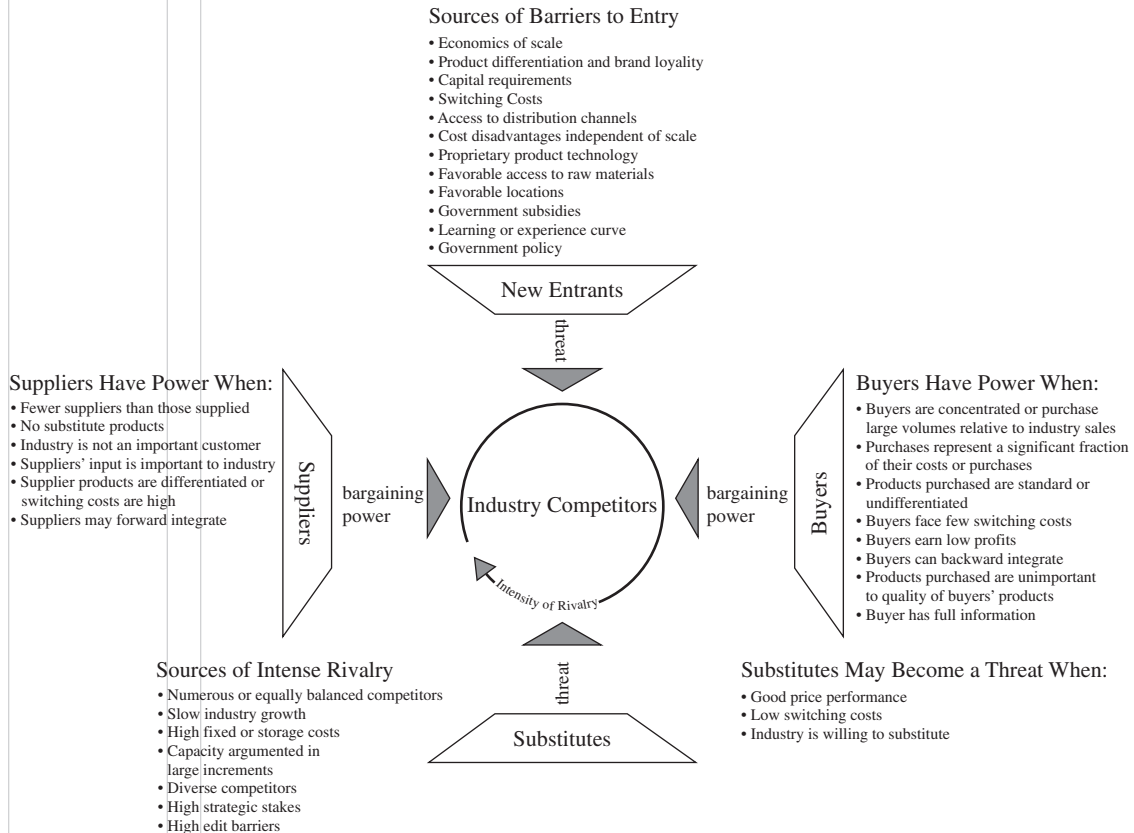
Industries comprise suppliers, buyers, potential new entrants, incumbent competitors and possible substitutes. These five sets of players constitute what came to be known as the *five forces model* (Exhibit 1.2), as each player has different means by which it can gain or retain competitive advantage in the industry (Porter 1980). New entrants might, for example, be kept out if incumbent competitors maintain sufficient barriers to entry. Suppliers might make a strong position in the industry even stronger by forward integrating into the industry competitors' businesses. An ideal industry in this model might have very few competitors, thousands of competing suppliers that could be pitted against one another to reduce prices and improve quality and service, millions of eager customers, no possible substitutes, and high barriers to entry for new participants. Upon finding such an industry, a firm would contrive to become the dominant player in that industry.

In the competitive strategy view there are limited options for how a firm might position itself to gain that dominant position:

- **Cost leadership:** A firm could aim to be the low-cost provider in an industry.
- **Differentiation:** A firm could stand out by delivering a set of unique products and/or services—those providing higher quality, better performance, and/or distinctive features.
- **Focus:** A firm could serve a narrow segment of the market, focusing on particular customer groups, product lines or geographic segments.

Within these three generic positions, firms might choose to further distinguish themselves by choosing one of the following three orientations (Porter 1996):

Exhibit 1.2

**EXHIBIT 1.2 Five Forces Model**Adapted from Porter, *Competitive Strategy: Technique for Analyzing Industries and Competition*, The Free Press, 1980.

- **Variety-based:** These firms tailor their activities to deliver particular varieties, features or services across a range customer groups, thus meeting a subset of customer needs. Examples include Southwest Airlines, offering no-frills service and Jiffy Lube, offering low cost, quick oil changes across all customer segments.
- **Needs-based:** These firms tailor their activities to meet the particular needs of a distinct customer group or purchasing occasion. IKEA, for example, serves young first time homebuyers and the like with a complete range of home and office furnishings.
- **Access-based:** These firms tailor their activities to reach differently accessible customers with similar needs. Carmike Cinemas, for example, operates theatres in cities and towns with populations under 200,000.

Ultimately, in the competitive strategy view, the key is to identify a desired position in the industry, and then structure the activities and develop the capabilities of the firm to match or fit the requirements of that position.

A popular approach to strategy development that arose from the competitive strategy view was the now classic SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis

### EXHIBIT 1.3 SWOT Analysis Approach to Strategy Design

Adapted from Porter, *Competitive Strategy: Technique for Analyzing Industries and Competition*, The Free Press, 1980 and Mintzberg, Ahlstrand, and Lampel, *Strategy Safari: A Guided Tour through the Wilds of Strategic Planning*, The Free Press, 1998.

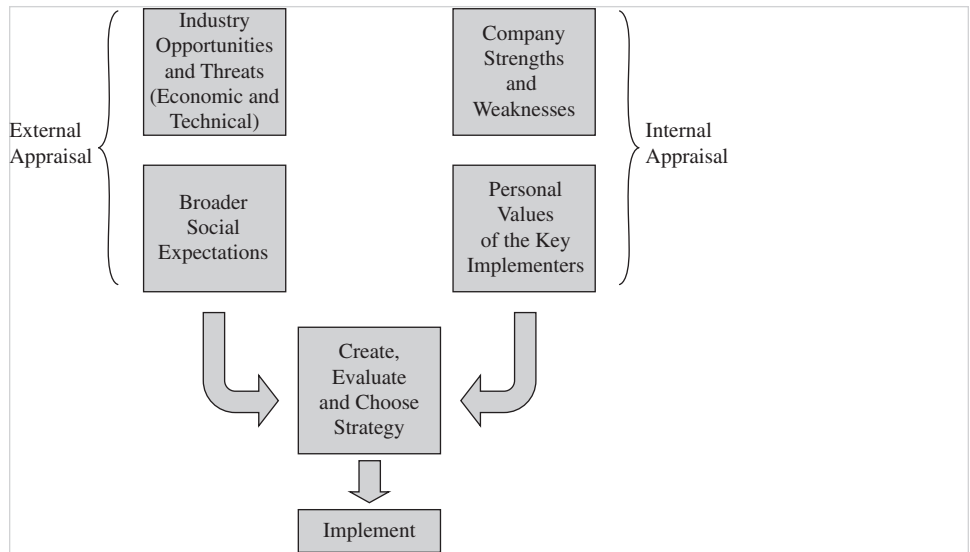


Exhibit 1.3

depicted in Exhibit 1.3. In a SWOT analysis, firms assess the threats and opportunities present in the external environment and, by creatively matching them with the strengths and weaknesses of the organization, determine where they should be positioned to obtain competitive advantage. They assess alternative strategies for internal consistency (whether the resulting goals and policies mutually reinforce one another) and for fit with both the external environment (whether they exploit opportunities and deal with threats) and internal resources (whether they leverage existing or planned strengths or avoid calling upon weaknesses of the firm).

Critics of the competitive strategy view argue that it

- Is too narrowly focused on industry and product economics rather than, for example, customer economics as the locus of competition.
- Allows too few options for positioning a firm. Indeed, looking at the conflicts among positions could well lead to creative new positioning options.
- Relies too much on analytical tools for strategy identification and assessment.
- Does not acknowledge the need for learning and adaptation over time.

Such criticisms gained strength in the 1980s, as researchers struggled to explain the rising power and global competitiveness of Japanese industry and the success of certain Japanese companies whose competitive advantage could not be explained simply by a positioning argument. Some Japanese companies, in fact, not only changed their competitive positioning rapidly over time—from, for example, low cost to high precision to flexibility to innovativeness—but transformed the nature of competition in the industry altogether (Hayes and Pisano 1996).

In part as a result of the desire to better understand the Japanese threat and Japan's approach to business and operations strategy development, the resource-based view of strategy gained attention and credibility. Various arguments were put forth. The main one was the notion that the focus of strategy development should shift from market positioning and



industry forces (the five forces model) to identifying unique sets of capabilities and resources that could be developed and exploited to provide long-term profitability (Wernerfelt 1984). Firms were urged to identify, focus, and build on their “core competences” to obtain competitive advantage in a variety of markets (Prahalad and Hamel 1990). Diversification was recommended as a mechanism to extract additional value from those capabilities and resources (Teece 1980 and 1982, Wernerfelt and Montgomery 1988). In short, the academics argued that firms should be viewed not just as portfolios of assets and separable businesses, or even just as bundles of human resources and organizational capabilities. Instead, they suggested that firms be viewed as sets of mechanisms by which new skills and capabilities could be selected and built dynamically over time (Teece and Pisano 1994). Overall, the conversation led to renewed emphasis on and definition of the resource-based view of strategy (Hayes and Pisano 1996).

### Capabilities Development and Leveraging: The Resource-Based View

While the competitive strategy view suggests that industry structure plays the central role in creating opportunities for superior profitability, the resource-based view argues that competitive advantage is derived from the firm’s development of its resources and capabilities. In this view, firms occupy different market positions because they possess unique bundles of resources and capabilities that are *valuable* (allow the firm to improve its market position relative to competitors); *rare* (in relatively short supply); and *inimitable* (difficult and costly to imitate or replicate). Resources and capabilities are difficult to replicate when they are protected by intellectual property laws or are costly to learn and develop.

Often the relationship between a set of resources and capabilities and the success of a firm is not clear to those outside the firm, so those resources or capabilities are not immediately sought or copied. This can leave the firm with a competitive advantage for some time (Hoopes et al. 2003). Even when it is obvious that a firm’s capabilities are providing it competitive advantage, its competitors often delay developing similar capabilities because they are wed to their own approaches to structuring operations. Companies with large-scale facilities, for example, might view smaller operations as inefficient, or companies that have invested heavily in automation might dismiss worker-intensive operations as unreliable or outdated. Many companies put too much faith in the power of their size, asset base, and market position and assume that they can replicate anything a competitor can do at a reasonable cost when needed. Numerous examples have proven these assumptions incorrect (Hayes and Upton 1998).

To more fully understand the resource-based view, we define the terms *resources* and *capabilities*. A resource is “an observable (but not necessarily tangible) asset that can be valued and traded—such as a brand, a patent, a parcel of land, or a license” (Hoopes et al. 2003, p. 890). It is “an asset or input to production (tangible or intangible) that an organization owns, controls, or has access to on a semi-permanent basis” (Helfat and Peteraf 2003, p. 999). Resources are the technologies, methodologies, and skills that are available to the firm that, when combined, can be used to create competitive advantage. The sustainability of this advantage depends on the ease with which the resources can be imitated or substituted. Resources can be classified as tangible (physical, technologies, financial), intangible (communication and information system, reputation, culture, brands), and human (specialized skills and knowledge, communication and interaction, motivation) (Lowson 2002).



A *capability*, on the other hand, is “not observable (and hence necessarily intangible), cannot be valued, and changes hands only as part of its entire unit” (Hoopes et al. 2003, p. 890). Capabilities are the processes, activities, or functions performed within a system and reflect the ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result. Competencies refer to the fundamental knowledge—know-how, experience, innovation and unique information—owned by the firm, while capabilities reflect an organization’s ability to use its competencies (Lowson 2002). Capabilities are enacted through a mixture of people and practices and are represented in such systems as American Airlines’ yield management system; Wal-Mart’s docking system, and Dell’s logistics system. (See the sidebar “Capabilities Development” for further description of these examples.) A capability can be valuable on its own or enhance the value of a resource. Nike’s marketing capability, for example, increases the value of its brand (a resource) (Hoopes et al. 2003).

In short, capabilities are developed through a firm’s experience, focus, and effort over time. As firms learn, they tune their capabilities, giving them a competitive advantage that is difficult to replicate without going through the same long-term learning process. Because the notion of capabilities can be somewhat vague, it is helpful to identify specific types of capabilities a firm might choose to develop, or find it already has. Although there are many possible ways to think about a firm’s capabilities, here are four dimensions along which they might be framed: process-based, coordination-based, organization-based (Hayes and Upton 1998) and network-based capabilities (Lowson 2002).

### *Process-Based Capabilities*

Process-based capabilities are anchored in the activities a firm undertakes to transform material or information into products and/or services. These capabilities are often focused on achievement of cost and quality outcomes. McDonald’s has invested significant research in developing its process for delivering low-cost, highly-consistent, fast food throughout the world. Note that in developing this capability, it excludes itself from doing other things well; McDonald’s has a much more difficult time allowing its customers to “have it your way” than does Burger King, for example. Nonetheless, McDonald’s has terrific command of the burger-making process—command that has allowed it to successfully replicate the process around the world with a high degree of consistency. Fidelity Investments, through investments in state-of-the-art image and audio capture technology, can enter information into its systems accurately and retrieve that information instantaneously when customers inquire about a previous transaction. Although they lag competitors in other dimensions of performance, these capabilities allow them to attract and retain customers seeking superior service (Hayes and Upton, 1998).

### *Systems- or Coordination-Based Capabilities*

Coordination-based capabilities derive from a firm’s skill in seamlessly executing multiple elements of its internal product or service delivery process to deliver high quality customer experiences, short lead times, a broad range of products or services, customization on demand, or rapid new product introduction. A firm might have a *process-based capability*—for example, a technology that none of its competitors have been able to imitate—that is not necessarily well integrated or coordinated with other activities in the firm, but nonetheless provides competitive advantage. Firms with *coordination-based capabilities*, on the

## Capabilities Development—Some Examples

### YIELD MANAGEMENT AT AMERICAN AIRLINES

American Airlines began developing its yield management capability in the 1960s when it pioneered a sophisticated reservation management system that was subsequently embodied in the Semi-Automated Business Research Environment (SABRE) that allowed American to centrally control the activities of reservation agents around the country. To this day, the SABRE group is a leader in both the methodology and technology of reservations management.

One of the critical elements of SABRE is the automated overbooking process; American estimates that without overbooking, 15% of the seats on sold out flights would otherwise be unused. The introduction of supersaver discount fares in 1977 and the deregulation of schedules and fares in 1979 created new opportunities for SABRE to “sell the right seat to the customer at the right time.” SABRE took on the task of allocating seats to each fare category and then dynamically adjusting the allocation as actual demand materialized. It, for example, retains a number of full-fare seats for those customers who make reservations close to the departure date and for whom price is less critical. To accomplish this, SABRE’s sophisticated forecasting model must take into account such complexities as the hub and spoke nature of its system, and thus the links between connecting flights.

The net impact of the Dynamic Inventory and Maintenance Optimizer (DINAMO) when it was first implemented was estimated at about \$1.4 billion in additional revenue over a three-year period, with only about 3% empty seats on sold-out flights. The capabilities that American developed through SABRE were of such significant value that its American Airlines Decision Technologies began applying yield-management to other industries including lodging, car rental, railroad, and broadcasting with significant benefits as well (Smith et al., 1992; [www.optims.com/UK/hight\\_profits.html](http://www.optims.com/UK/hight_profits.html), August 15, 2005).

The importance of the SABRE capability grew at American throughout the years. In 1993, AMR Corporation (American Airlines’ parent) formed the SABRE Technology Group which included AMR Information Services, SABRE Travel Information Network, SABRE Computer Services, SABRE Development Services, and AMR Project Consulting

and Risk Assessment. In 1996, AMR announced that the SABRE Group was filing for an initial public offering, and in 2000 completed its spin-off into an independent company ([www.aa.com/content/amrcorp/corporateInformation/facts/history.jhtml](http://www.aa.com/content/amrcorp/corporateInformation/facts/history.jhtml), August 20, 2005). Today, the SABRE Holdings is an S&P 500 company that contains Travelocity.com, an online travel service; the SABRE Travel Network, which offers electronic services to travel agencies, travel suppliers, corporations, and government agencies; and SABRE Airline Solutions, which offers solutions and services to optimize operations and reduce costs for airlines, airports, and government agencies ([www.sabre.com/](http://www.sabre.com/), August 20, 2005).

Meanwhile, American continues to leverage the capabilities SABRE caused it to develop. In March 2000 it received CIO Magazine’s 2000 Web Business 50/50 Award for its website, and in September 2002 it announced an EveryFare program that provided traditional travel agents with the option to access and sell the low fares previously only available on American’s own website. In exchange, travel agents provided American with long-term distribution cost savings through a cost-sharing arrangement.

Although these capabilities have clearly not been sufficient to keep American solvent through recent years, they provided the company with significant advantages over the years and have continued to be valuable in their new form at SABRE Holdings.

### WAL-MART’S DOCKING SYSTEM

In 1979, Kmart was king of the discount retailing industry with 1,891 stores and average revenues per store of \$7.25 million. Its size provided it with economies of scale in purchasing, distribution, and marketing that made it a formidable competitor. Wal-Mart, on the other hand, was a small niche retailer in the South with only 220 stores and average revenues about half those of Kmart stores. By 1989, however, Wal-Mart had transformed itself and the discount retailing industry; growing nearly 25% a year, the company achieved the highest sales per square foot, inventory turns, and operating profit of any discount retailer. Its 1989 pretax return on sales of 8% was nearly double that of Kmart.

Wal-Mart’s success was attributed to its focus on a small set of goals: to provide customers access to quality goods, to make these goods available when and where

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customers want them, to develop a cost structure that enables competitive pricing, and to build and maintain a reputation for absolute trustworthiness. One of the key ways in which the company sought to meet these goals was through its inventory replenishment system that involved cross-docking. In this system, goods are delivered to Wal-Mart's warehouses, sorted, repacked, and sent out to its stores without sitting in inventory. This allows Wal-Mart to purchase full truckloads of product but avoid the inventory and handling costs associated with storing the goods, which in turn allows it to offer lower prices, which in turn allows it to avoid promotions that lead to large inventory fluctuations.

While cross-docking is a relatively common concept today, it was not in the 1980s when Wal-Mart started it. To make cross-docking work and obtain all of its advantages, Wal-Mart had to make significant investments in information systems that linked its distribution centers, suppliers, and point-of-sale systems through a private satellite-communications system and a fast and responsive transportation system of its own dedicated fleet of trucks. These investments were matched with a human resource management system that encouraged cooperation among stores, distribution centers, and suppliers and a strong sense of ownership by middle management for operating the business.

The capabilities Wal-Mart developed to support and leverage its cross-dock system yielded it \$244.5 billion in revenues for 2002, or four times what the number two retailer, Home Depot, sells in a year. Wal-Mart now does more business than Target, Sears (now owned by Kmart), Kmart, J.C. Penney, Safeway, and Kroger combined, taking in 7.5 cents of every dollar spent in any store (other than auto-parts stores) in the United States (Fishman 2003). Kmart, meanwhile, declared bankruptcy in 2002 and is still in the process of reorganization (<http://money.cnn.com/2002/01/22/companies/kmart/>, August 20, 2005).

Considerable controversy surrounds Wal-Mart today as people question the effects of Wal-Mart's tough negotiations on the U.S. supply base (Fishman 2003) and document the status of Wal-Mart employees (Ehrenreich 2001). Nonetheless, much has been learned from observation of the capability set it developed around its inventory management system.

### DELL'S LOGISTICS SYSTEM

The Dell Direct Model, launched when Michael Dell founded Dell Computer Corporation in 1984, has five

underlying tenets ([www.us.dell.com/content/topics/global.aspx/corp/background/en/directmodel?c=us&l=en&s=corp](http://www.us.dell.com/content/topics/global.aspx/corp/background/en/directmodel?c=us&l=en&s=corp), 8/20/05):

1. Most efficient path to the customer—a direct relationship with no intermediaries
2. Single point of accountability—Dell coordinates all resources required to meet customer needs
3. Build-to-order—a custom configuration and ordering system that minimized inventories and lead times
4. Low-cost leader—through investment in continuous improvement of a highly efficient supply chain
5. Standards-based technology—that allows Dell to access low-cost technologies quickly, and mix and match them in its highly modular products

With this system, Dell strives to balance supply and demand, holding as little inventory as possible to meet its customers' needs. Dell controls its value chain from procurement through the delivery of the finished product, eliminating the middleman, which allows it to exert greater control over cost, quality, and time. Its logistics process is quintessential just-in-time. Supplies and components are pulled through the value chain allowing Dell to operate on only eight days of inventory. Dell's shared logistics centers (SLCs) are the hubs that hold the inventory for its factories, which can pull material in from the SLCs within minutes of receiving a customer order. The factories hold only about six hours of inventory, so the SLCs play a critical role in buffering against fluctuations in demand.

Dell uses Internet technology to make its logistics function efficient and effective, providing customers with online order status information, and to work real time with suppliers and customers to engage in collaborative product development. Dell is able to receive feedback from suppliers regarding their capacity to produce certain quantities of components, and information on inventories in their supply lines, as well as current cost structures. Dell can also manage and smooth demand through active management of its sales through its own website.

Dell's corporate culture reflects their highly efficient logistics system. Transmission of information both internal and external to the organization is done real time, revolutionizing the way suppliers, manufacturers and customers interact. Product designs can be developed in a matter of days, incorporating efforts of engineers around the world. Shared goals—to reduce

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inventory costs throughout the value chain—breed cooperative efforts between Dell and its suppliers.

According to Dell executives, the advantages of Dell's innovative supply-chain management system translate directly to the consumer (Vargus, 2003):

- Customers have immediate access to the latest most relevant technology
- Suppliers get their products to market quickly
- Quality is improved with fewer touches

- Communication is immediate and accurate
- Cost-savings and efficiencies are passed on to our customers

Since its IPO in 1989, Dell's annual revenues have grown from \$0.3 billion to nearly \$50 billion ([www.us.dell.com/content/topics/global.aspx/corp/investor/en/history?c=us&l=en&s=corp&~ck=mn](http://www.us.dell.com/content/topics/global.aspx/corp/investor/en/history?c=us&l=en&s=corp&~ck=mn), August 20, 2005). Its capabilities in logistics management continue to be held up as an outstanding example.

other hand, integrate activities across the firm to achieve competitive advantage. The Ritz-Carlton Hotel, for example, coordinates its activities—reception, housekeeping, dining, and banquet services—to provide the guest a quality experience from arrival to departure (Heching, 1998). Southwest Airlines coordinates the multiple activities associated with low-cost air travel—from ticketing to seat assignments to beverage and snack delivery to luggage handling—better than its competitors. With this capability, it has outperformed much of the airline industry despite attempts by a number of its competitors, such as Continental which offered Continental Lite, to imitate its offerings.

### *Organization-Based Capabilities*

Firms sometimes described as learning organizations or good at knowledge management are said to have organization-based capabilities. These firms have developed organization-wide skills to master new technologies, product designs, or processes and bring them online significantly faster than their competitors. Nucor Steel, a steel recycling company whose business has grown nearly 20% per year since its entry into steel making in 1973, prides itself on its mastery of steel-making processes. It learns from various sources including universities, competitors, equipment manufacturers, and its own operations and applies that knowledge to run its facilities highly efficiently. (See sidebar “Organization-Based Capabilities at Nucor.”) Organization-based capabilities are particularly difficult for others to replicate, as they are embedded in the routines and tacit knowledge of the organization. As such, they make particularly formidable competitive weapons.

Information technology and management can also be key to the development of organization-based capabilities. The primacy of information—whether about customers, competitors, technologies or suppliers—in today's business environment suggests that managing information is a potential source of competitive advantage. Firms may develop capabilities in information awareness, decision architecture, knowledge/information architecture, organizational focus on information collection and use, and information network management that will provide them a competitive edge (Mendelson 1999). Consulting firms such as Accenture are well aware that the knowledge they bring to bear in their consulting assignments is a critical capability of their firm. They guard that knowledge carefully and have built sophisticated information systems to capture and manage it. Intuit, provider of Quicken and Turbo-Tax personal financial management tools, has deep knowledge of its customers and how they manage their finances. This

## Organization-Based Capabilities at Nucor\*

Nucor Corporation is arguably the most innovative and fastest growing steel company in the world with annual compounded sales growth of 17%, profit margins consistently above industry medians and average annual returns to shareholders in excess of 20% for the past 30 years. Its success cannot be explained by external factors: it is not in a growth industry, there are few critical barriers to entry for the business, and it has little brand recognition or market power in the commodity steel marketplace.

Instead, Nucor's success has come about because of its "social ecology"—the social environment in which its people operate—which in turn supports strongly effective knowledge management. Nucor excels in all of the key elements of the knowledge management process:

- Knowledge creation because of its
  - Superior human capital, which it accesses by locating plants in rural areas with an abundance of hard-working, mechanically inclined people and then invests in training.
  - High-powered incentives in which employees can earn large incentive bonuses for productivity and quality gains.
  - High degree of empowerment, which includes both a high tolerance for failure and a high degree of accountability.

- Knowledge acquisition, because employees motivated by the desire to improve performance continually scan the outside world for new technology developments and are willing to take risks in implementing them.
- Knowledge retention because it does not lay people off in downturns and cultivates a high degree of loyalty and commitment among its personnel.
- Knowledge identification through systematic performance measurement at all levels of the organization, which allows comparison and sharing of performance gains and ways to achieve them.
- Knowledge outflow because the incentive system is structured to encourage not only productivity gains at the local level, but across the organization.
- Knowledge transmission both within plants, which are kept small to encourage regular communication, and across plants using performance metrics, group meetings of plant managers, and plant visits.
- Knowledge inflow, again driven by the incentive system to take in any and all new information that is useful to improving performance.

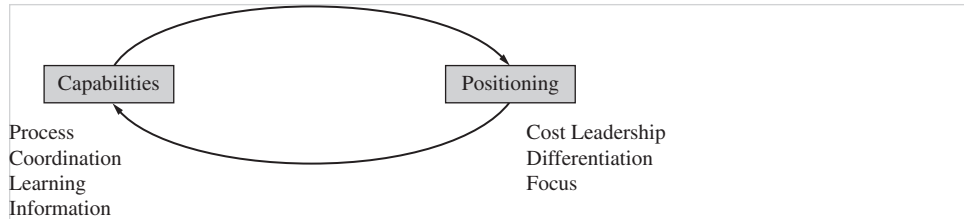
\*Based on Gupta and Govindarajan, 2000.

knowledge has allowed Intuit to retain a competitive lead over Microsoft's Money and other comparable products.

### *Network-Based Capabilities*

Finally, network-based capabilities are those that reach outside the bounds of a single organization and encompass the entire value chain or supply network. Firms with strong network-based capabilities are able to guide, or at the very least work well with, the other players in their value chain to improve the efficiency of the value chain overall. Zara, the clothing manufacturer, distributor, and retailer, coordinates its supply chain—a large centralized warehouse with tightly integrated production facilities, a well-coordinated transportation network, and tight information integration with its retail outlets—to deliver a high mix of products with short life cycles at relatively low cost. Dell's renowned logistics management system integrates product design with supplier management with internal assembly operations with a strong sales information system to provide efficient design, production, and delivery of computers and related products.

**EXHIBIT 1.4**  
**Strategy-**  
**Making**  
**Process with**  
**Traditional**  
**Positioning**  
**Options**



### **Integrating the Competitive Strategy and Resource-Based Views**

Despite the sometimes acrimonious debate between the competitive strategy and resource-based views, we integrate them in this book, as we believe strategy comes about through an iterative process that employs both perspectives (Mintzberg et al., 1998; Hax and Wilde 2001). On the one hand, firms may choose a position in the marketplace and then develop the capabilities they need to take that position. When Southwest Airlines was founded, for example, it chose a market segment in which to compete and then developed the (coordination) capabilities to excel in that market. In the long run, as its competitors attempted to move into its market, they found it extremely difficult to imitate Southwest's capabilities as they were much farther down the learning curve (Hayes and Upton 1998). On the other hand, firms may examine their capabilities and choose to leverage them in identifying new businesses or market segments in which to compete. Amazon.com, for example, started by selling books but determined that its capabilities in selling via the Web might be applied in other sectors as well. Thus, it seeks new market opportunities, such as warehousing and selling toys for Toys R Us or household merchandise for Target, that allow it to leverage the capabilities it has built.

Strategy, in short, is deciding where you want your business to go and how you want to get there. It is an iterative process of examining the marketplace for opportunities and leveraging the firm's ever changing capabilities in new and interesting ways. Exhibit 1.4 captures this iterative process in the beginning of a framework we will build on later in this chapter.

Exhibit 1.4

## **How Strategy Is Made: Intended, Emergent, and Realized Strategy**

Thus far, the view we've presented of strategy-making suggests that managers can assess, perhaps rather analytically, their organizations' positions in the marketplace and their capabilities, devise a strategy and then implement it. This view of strategy as a plan or set of guidelines to take the organization into the future is not a fully accurate representation of the use of the word *strategy* in business today. In fact, if you ask someone to describe the strategy of his or her own organization, or that of a competitor, what you most often hear about is not what that organization intended to do, but what it actually did. The cover of Eagle Materials' 2004 annual report, for example, proclaims them to be "absolutely, positively a low cost producer with high margin products" and proceeds to describe the ways in which the company reduced costs during the year (<http://ir.eaglematerials.com/downloads/ar2004.pdf>). Thus, we think of strategy not only in terms of planning a future direction, but as reflecting the pattern of decisions an organization has made over time.

Consider, for example, the cereal manufacturer whose stated operations strategy was to be highly flexible and thus able to respond to changes in demand from the marketplace



as well as to marketing requirements for all kinds of special promotions such as putting an action figure in the cereal box. While the manufacturing manager was quite clear about this focus and showed supporting strategic planning documents, manufacturing engineers on the shop floor were using very different criteria to justify investments in new capital equipment. When asked how to best justify an equipment purchase, the engineers explained that they had to show how the investment would pay for itself in reduced labor and floor space costs. Showing that the new equipment would improve the plant's flexibility was inadequate. Although this organization's stated strategy was to be flexible, the pattern of decisions made by those actively managing and changing plant operations was to reduce cost.

So, in fact, organizations have both *intended* strategies, which are generally conceived by the top management team, typically through a process of negotiation, bargaining, and compromise among many individuals in the organization, and *realized* strategies, which reflect the actual pattern of decisions they have made over time. But, even this representation is overly simplistic. In practice it is extremely difficult—impossible, really—to execute an intended strategy fully as laid out. But, if an organization accomplishes some portion of that strategy, its realized strategy will at least partially match its intended strategy. The portion of an organization's intended strategy that reaches fruition is sometimes called a *deliberate* strategy, while the portion that does not is called an *unrealized* strategy (Mintzberg et al., 1998).

There is yet another path to a realized strategy. *Emergent strategy* arises from the day-to-day patterns of decisions that managers make as they both interpret the intended strategy and accommodate the many changes that arise from the external environment. Individual actions may, over time, evolve into a consistent pattern of decisions that leads the organization in a new direction. Thus, the realized strategy of the organization may, at least in part, emerge from a pattern of unintended decisions made by the organization. Capabilities are sometimes discovered in this way. A company may not be aware of the full potential of the capabilities it is developing until a sudden insight or fortuitous incident reveals how they can be exploited. Thus, strategies based on capabilities are as likely to be emergent as they are to be the product of traditional strategic planning (Hayes and Upton 1998).

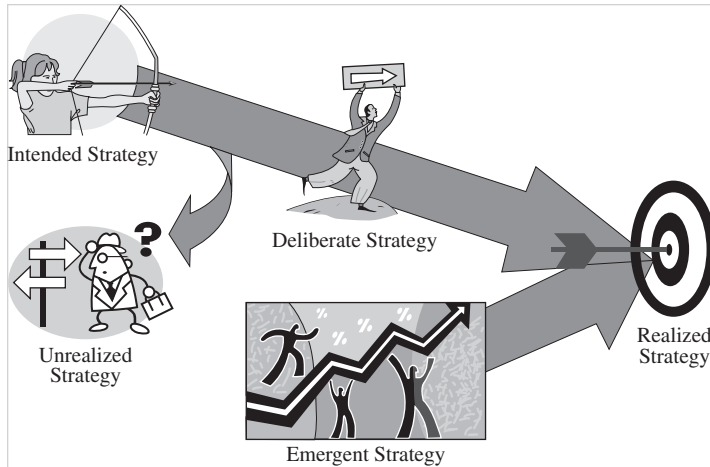
Organizations rarely follow just one of these paths to their realized strategy (Exhibit 1.5). Rather, they set forth plans for the future (intended strategies) and at the same time engage in an experimentation and learning cycle that allows them to adapt to the changing realities of the environment in which they operate. This provides some balance between the control provided by executing against an intended strategy and the real-time responsiveness provided by allowing an emergent strategy to evolve. The appropriate balance is determined by the industry in which the organization plays. In rapidly and unpredictably changing industries, it is difficult to envisage which industries, competences, or strategic positions will be viable and for how long, and the key strategic challenge becomes how to cope with ongoing and rapid change. At the extreme, such organizations define strategy as “the creation of a relentless flow of competitive advantages that, taken together, form a semi coherent strategic direction. The key driver of superior performance is the ability to see change. Success is measured by the ability to survive, to change, and ultimately to reinvent the firm constantly over time” (Brown and Eisenhardt 1998).

In this book, we focus on the key decisions that make up an operations strategy and provide tools that are useful to both extremes in strategy-making. We support the planning strategist—the senior manager providing long-term direction to his or her organization—

Exhibit 1.5



**EXHIBIT 1.5**  
Types of Strategies



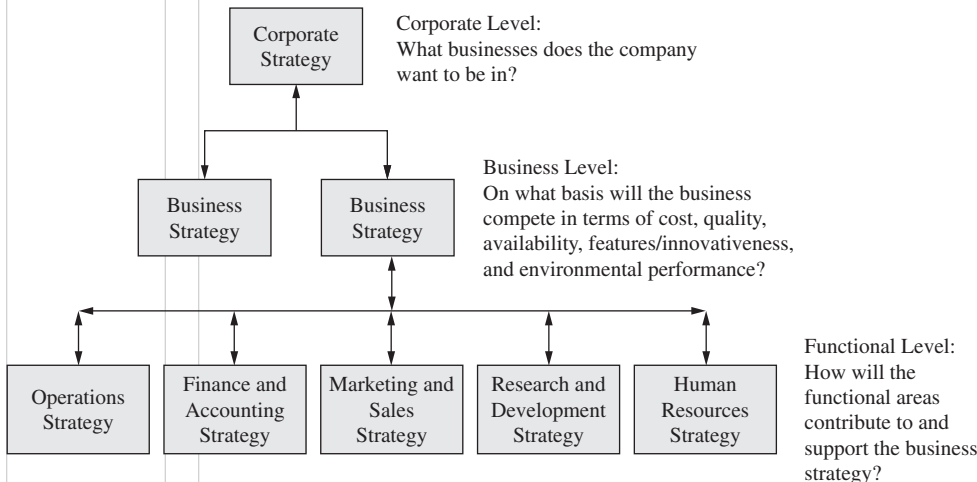
and the emergent strategist—the individual making a seemingly stand-alone decision that may well have far-reaching effects throughout the organization.

**Corporate, Business, and Functional Strategies**

Exhibit 1.6

Strategy is defined at multiple levels in the organization as depicted in Exhibit 1.6 (Hofer and Schendel 1978). At the *corporate level*, decisions are made about the scope of the firm, including the choice of industries and markets in which it will participate. At the *business level*, decisions entail choosing specific market segments in which the firm will compete, deciding how the firm will position its products and services to compete in those markets, and determining which of the firm’s capabilities to leverage and how. In effect, decisions made at this level determine how the firm will obtain and/or retain competitive advantage

**EXHIBIT 1.6** Levels of Strategic Planning



or how it will shift the competitive dynamics of the industry to form new opportunities. At the *functional level*, decisions are made about how to synergistically structure the activities in operations, finance and accounting, marketing, research and development, and human resources to support or create competitive advantage. The functions, individually or collectively, may offer resources, capabilities, and competencies from which new sources of competitive advantage may be derived, and on which new business strategies may be developed. This book focuses on the functional level, specifically on strategy for the operations function. We examine each level of strategy-making here however, to provide a sense of the broader context in which operations strategy is made.

## Corporate Strategy

Corporate strategy identifies the industries and markets in which a firm will compete. Corporate strategists make decisions that implement these choices, including investment in and divestment of businesses as well as allocation of resources among existing businesses. In essence, they manage the portfolio of businesses in which the firm participates, investing more or less in those businesses as needs shift in the broader market. See the sidebar “Corporate Strategy at Eaton Corporation” for a detailed description of the evolution of a corporate strategy over time.

As the Eaton example suggests, corporate strategy entails forming and reforming the corporation’s portfolio of businesses over time in response to both the needs of the businesses in the portfolio and the pressures of the external environment. Corporate strategists may seek synergies among the businesses they manage that will allow the company to obtain a better position in the marketplace, or they may simply seek improved financial performance through an acquisition or divestiture. They will set performance expectations and determine appropriate levels of investment in the businesses in the existing portfolio. The financial strategy of the company is clearly a critical part of corporate strategy setting, as the company seeks funds for investment or from divestiture. Further discussion of corporate strategy—its content and how it is developed and executed—is beyond the scope of this book.<sup>2</sup> It is important to understand, simply, that operations strategy is typically determined within the broader context of corporate strategy.

## Business Strategy

Business strategy is focused at the level of the individual business or business unit within the firm, and is concerned with where the business positions itself within a particular industry or market as well as with how and with what capabilities the business will win customers, cooperatively and/or in competition with other players in its industry. Empirical evidence from a study of over 100 companies found that those companies that engaged in system level thinking (Sterman 2000) about their business strategies significantly outperformed those that focused at the product level. Specifically, the study (Hax and Wilde 2001) differentiated three views a firm might take in setting strategy:

1. **Best Product:** This view comes from the classic competitive strategy field of thought. Simply, it focuses on beating the competition by positioning the firm’s products or

Footnote 2

<sup>2</sup> Students interested in strategy-making at the corporate level will find *Contemporary Strategy Analysis* by Robert M. Grant, Blackwell Publishers Inc., a useful reference.

# Corporate Strategy at Eaton Corporation

Eaton Corporation, the former parent of Axcelis, is a large, global, diversified industrial manufacturer. It defines its four primary businesses as fluid power systems, industrial and commercial controls, automotive, and truck. Within each of these primary businesses, it defines a number of secondary businesses or divisions, each focused on a particular product, technology, and/or market. Its corporate strategy, however, has evolved continually since the founding of the company a gear and axle company in 1911 (Exhibit 1.7). In the early years of the

corporation, much of the corporate strategy focused on diversification and growth through acquisition, and it expanded from axles and gears into springs, bumpers, valves, transmissions, and power devices. Its interest in ion implanters, the products that Axcelis makes today, came about in 1983 when Eaton formed a joint venture with Sumitomo. In recent years, Eaton divested a number of businesses to focus more tightly on a smaller number of industries and markets. Axcelis Technologies was spun out of Eaton in this divestment process in 2000.

Exhibit 1.7

services as low cost, having a unique set of features, or targeting a focused or niche segment in the market.

2. Total Customer Solutions: This view puts the customer, not the competitor, front and center. It argues that deep understanding of customers and the subsequent development of close relationships with those customers to support them in creating their own economic value is the best way to succeed. Firms competing with this focus organize their supply chains to be responsive in providing a family of products and/or services that closely match customer requirements.
3. System Lock-In: This view includes the extended enterprise—the firm, the customers, the suppliers, and most importantly those firms whose products and services enhance the strategy-making firm’s own product and service portfolio. The key to success in this view is to identify, attract and nurture those firms whose products and services are complementary, engaging them in a collective effort to please the customer.

In this study, firms engaged in “system lock-in” far outperformed those employing “total customer solutions” or “best product” strategies in both Market Value Added (MVA) and Market-to-Book Value (Exhibit 1.8).

Exhibit 1.8

Thus, to develop business strategy, the firm must think about its positioning not only in terms of its competitors, but also in terms of its customers, suppliers, and potential “complementors.” The firm must develop and nurture an integrated value chain, paying particular attention to those firms whose products and services complement its products and services, with the intent of working closely with those firms to provide better solutions to customers than any other set of firms can. Underlying this system-level view of the firm’s business environment is a clear understanding of the customers and users of the firm’s products or services.

### *Keeping an Eye on the Customer*

For over 30 years, research on the success and failure of products has shown lack of understanding of customer and user needs to be a critical failure mode (Rothwell 1972, Zirger and Maidique 1990). Today, increasingly, we appreciate that understanding customers is core to strategy development and execution. There are many different frames in which one might look at customer and user needs. The Kano Method (Stein 1996) recognizes the

**EXHIBIT 1.7****Evolution of Eaton's Corporate Strategy through Investment and Divestment**

Source: Data drawn from Eaton Corporation: [http://eaton.com/NASApp/cs/ContentServer?pagename=EatonCom%2FPage%2FEC\\_T\\_TwoThirdsBodyNav&c=Page&cid=1008110157919](http://eaton.com/NASApp/cs/ContentServer?pagename=EatonCom%2FPage%2FEC_T_TwoThirdsBodyNav&c=Page&cid=1008110157919) (accessed August 20, 2005).

Era	Acquisitions	Divestitures
1920s	Axles Chassis leaf springs Bumpers	
1930s	Engine valves, tappets, valve seat inserts, hardened and ground engine parts Coil springs Engine valves	
1940s	Eddy current power devices	
1950s	Heavy-duty transmissions Axles Forging	
1960s	Marine products Locks, hardware, material-handling equipment Appliance and automotive valves Clutches, brakes, and compound rubber golf club grips Overhead conveyor cranes and stackers Fasteners Automotive parts distribution Micro-miniature connectors for electronics and communications industries	Marine products
1970s	Hydraulic motors for agriculture and industrial equipment Industrial control and power distribution, aircraft, commercial, appliance, and semiconductor	
1980s	Joint venture in hydraulic motors and transmissions Joint venture in ion implanters 30% interest in industrial controls Hydraulics	Materials handling
1990s	Industrial control and power Engineered components for industrial, aerospace, and automotive markets	Appliance Controls Worldwide Axle and Brake business
2000	Sumitomo Heavy Industries Ltd.'s interest in fluid power joint venture	Axcelis Technologies, Inc Automotive Vehicle Switch/Electronics Division

**EXHIBIT 1.8 Relative Performance of Three Positioning Strategies**

Source: Hax and Wilde, *The Delta Project: Discovering New Sources of Profitability in a Networked Economy*, Palgrave, 2001.

Strategy	Number of Firms in the Study Employing This Strategy	Relative Market Value Added Performance	Relative Market-to-Book Value Performance
Best product (classic positioning strategy)	74	1.0	1.0
Total customer solutions	67	1.6	1.2
System lock-in	16	4.0	2.0

sometimes nonlinear relationship between fulfilling a need and satisfying a customer. It defines four types of needs:

1. **Must Haves:** A must have will never make a customer happy; it is simply expected that the product will have this feature.
2. **Linear Satisfiers:** A linear satisfier is a characteristic that, when improved, improves customer satisfaction in linear fashion. There is typically a minimum threshold for the performance of the feature, and anything better than that threshold is considered good.
3. **Delighters:** A delighter can only have a positive effect on customer satisfaction, and its absence never creates customer dissatisfaction.
4. **Neutral:** Things about which the customer is neutral will not change his or her level of satisfaction with the overall product or service if this feature is lacking or included.

A simplified version of this framework suggests that there are order qualifiers and order winners. Order qualifiers include those criteria that a company must meet for a customer to even consider it as a possible supplier. Order winners are those criteria that will win the order (Hill 2000).

In this book, we use a framework that has been used in various forms in the operations strategy literature for some time (Dangayach and Deshmukh 2001) but adapt it to reflect, at the business strategy level, the expectations customers place on a firm’s output. We focus on understanding customer needs along the dimensions of cost, quality, availability, features/innovativeness, and environmental performance (Hayes and Wheelwright 1984) and define these multidimensional attributes as summarized in Exhibit 1.9.

**Cost** We define cost as the cost of the product or service to the customer. Cost thus includes not only the purchase price of the product or service, but the cost of ownership as well. Customers, and thus companies, emphasize different aspects of the cost dimension

Exhibit 1.9

**EXHIBIT 1.9**  
**Customer**  
**Requirements-**  
**Cost, Quality,**  
**Availability,**  
**Features and**  
**Environment**

Dimension	Definition
Cost	Purchase price to the customer Cost of ownership—lifetime cost of owning, using, and maintaining the product or service
Quality	Tangible characteristics: Aesthetics Reliability, durability, and safety Serviceability Intangible characteristics: Competence, courtesy, understanding, and communication Access and security
Availability	For purchase: Off-the-shelf or make-to-order Of new products: Rapid cycle or planned evolution
Features/ innovativeness	Inherent characteristics of a product or service Range of products available: Degree of customization Degree of innovation
Environmental performance	Degree to which process that produces and delivers the product or service is environmentally sound Degree to which the product or service itself is environmentally sound and reusable or recyclable

**EXHIBIT 1.10 Tangible and Intangible Dimensions of Quality**

Sources: Data drawn from Garvin, *Managing Quality: The Strategic and Competitive Edge*, The Free Press, 1988 and King, *A Framework for a Service Quality Assurance System*, Quality Progress, 1987.

Tangible Quality Dimensions	Intangible Quality Dimensions
Reliability: probability of successful operation, consistency of performance Durability: length of usefulness, dependability	Competence: possession of skills and knowledge required to perform the service Courtesy: politeness, respect, consideration for property, clean/neat appearance
Safety: for end user Serviceability: ease of repair Aesthetics: pleasing to the senses	Credibility: trustworthiness, believability Understanding: of customer needs and wants Communication: educating and informing consumers Access: approachability and ease of contact Security: freedom from danger, risk, doubt

depending on what industry they are in. Customers procuring products such as shampoo or shaving cream are likely to focus their assessment of the cost of the product to them on its purchase price. Customers of products such as manufacturing equipment, automobiles or airplanes, on the other hand, are likely to consider the product’s cost of ownership along with its purchase price including costs to install, run, maintain, and dispose of the product.

Companies may choose to compete primarily along this cost dimension. Retail outlets such as Wal-Mart, for example, focus on providing goods at the lowest possible cost to the consumer. Wal-Mart in particular has developed network-based capabilities that allow it to achieve low cost performance throughout its supply chain. Valero and ARCO focus on providing (relatively) inexpensive gasoline to consumers. JetBlue focuses on providing low-cost air travel.

**Quality** Customers evaluate the quality of the products and/or services they procure along many dimensions and integrate these assessments into an overall assessment of the quality of their experience with the organization. In examining quality, it may be important to differentiate assessments of the actual quality delivered from the quality perceived by the customer. Ultimately, some argue, perception has the most effect on a customer’s short-term buying decision; in the longer run actual quality experienced by the customer may matter more. A customer’s overall assessment of quality judges both the tangible outputs gained, as well as the intangible aspects of the purchasing or service experience (Exhibit 1.10).<sup>3</sup>

The tangible aspects of quality include the aesthetics of the product, or output of the service, how reliable it is over what period of time, whether or not it is safe, and how straightforward it is to service or repair. The intangible aspects of quality—that may be assessed in making a purchase decision about a product or a service—include the competence, courtesy, and credibility of the people involved in the process, as well as the degree to which those people understand the customers’ needs and communicate well with the customers. They also

<sup>3</sup> Note that some authors include product features as a dimension of quality. We choose to include features as a separate category. Responsiveness (willingness or readiness to provide service) is also sometimes included as a dimension of quality. We include responsiveness in our definition of availability.

Exhibit 1.10  
Footnote 3

include assessments of the environment surrounding the purchase process or service, including considerations such as accessibility and security.

Business strategists must decide where they want to position their businesses along these various dimensions of quality. The Ritz Carlton hotel chain, for example, is quite clear in its specification of a very high quality experience for its customers. The credo for the hotel spells this out:

The Ritz-Carlton Hotel is a place where the genuine care and comfort of our guests is our highest mission. We pledge to provide the finest personal service and facilities for our guests who will always enjoy a warm, relaxed, yet refined ambience. The Ritz-Carlton experience enlivens the senses, instills well-being, and fulfills even the unexpressed wishes and needs of our guests ([www.ritzcarlton.com/corporate/about\\_us/gold\\_standards.asp](http://www.ritzcarlton.com/corporate/about_us/gold_standards.asp)).

The Ritz invests heavily in quality management programs to offer a quality experience across all of the dimensions described in Exhibit 1.10. Not only do they offer high-quality tangible outputs (“the finest personal service and facilities”), but the intangibles (“a warm, relaxed, yet refined ambience”) made possible by well-trained Ritz “Ladies and Gentlemen” (as Ritz calls its employees) are high quality as well (Heching 1998).

**Availability** The emphasis on time in today’s markets is captured in the availability dimension. Customers expect products or services to be available when they want them and/or when they were promised. Availability requirements clearly vary by business. Grocery store customers expect products to be available on the shelves when they go shopping. An out-of-stock item is a lost sale for a particular brand or product in most instances, although it may not be a lost sale for the store itself. Airlines buying airplanes, on the other end of the spectrum, do not expect to buy their products off the shelf, but they do expect delivery when promised. Plans are made months ahead of projected delivery to put the new aircraft into service immediately upon delivery, possibly retiring and replacing another aircraft. Late deliveries can cause great disruption to an airline’s entire schedule. Service customers also have different demands for the execution of a service. Customers at McDonald’s expect to receive their meals within two to three minutes of ordering, while customers at upscale restaurants expect a longer wait for their meals.

Availability applies to new product introductions as well. Some industries such as consumer electronics focus on fast time-to-market for new products. Others have longer product development and introduction cycles but must deliver new products when promised. Semiconductor equipment manufacturers such as Axcelis, for example, average 2 to 3 years to develop and introduce new products and introduce new platform products about every 10 years. They must, however, meet the requirements of the semiconductor fabricators for new generations of equipment as new generations of semiconductor chips are developed. Although their product development cycles are not as rapid as those of the consumer electronics manufacturers, they must have predictable completion dates.

Finally, availability refers to the variety of products a company offers. There is a wide spectrum of ways in which companies offer customized products or services to their customers. On one end of the spectrum, McDonald’s and FedEx offer a moderate range of options to their customers that allow the customers to choose products or services that best meet their needs. On the other end of the spectrum, large-scale projects such as the space shuttle are fully custom designed to the customer’s specifications. In between lie companies such as Dell that assemble standard components to customer orders and tailors who cut and assemble parts from standard patterns to customer order. Thus, availability



describes the firm's ability to deliver the variety of products or services its customers want when they want them.

**Features and Innovativeness** Customers also look at the features that are offered by a product or a service and at the level of innovativeness of the product or service. Features are the inherent characteristics of the product or service. One can buy a highly featured car, such as a high-end BMW or Mercedes, or a less featured car, such as a stripped down Toyota or Saturn. One can buy highly featured services, such as business class fares on full-service airlines like United and American, or less featured services, such as passage on Southwest Airlines' "no frills" flights or JetBlue's "younger, fresher, more innovative, but simpler" airline.

We distinguish the features and innovativeness dimension from the quality dimension. Take the car industry, for example. Some would argue that a BMW is a higher quality car than a Toyota or a Saturn because it is more fully featured and employs more innovative technology. But, Toyota often outperforms BMW in number of defects per vehicle. Thus, we argue that BMW competes better on the features and innovativeness dimension, while Toyota competes better on at least some dimensions of quality. Similarly, some would argue that the experience in business class on United is of higher quality than the experience on JetBlue because it offers more features. They might agree, on the other hand, that the competence, courtesy, and credibility of the gate agents checking them in for their flights—whether on United or JetBlue—are equivalent. Thus, the airlines could be said to be differentiating themselves on the features they offer, while the quality of their services is similar. Alternatively, some would argue that their experience with JetBlue was of higher quality than that with United or American, even though fewer features are offered. Then, differentiation might be based on the quality of key features of the offering, rather than on a full set of features. Because features and innovativeness do not always track directly with quality, we differentiate the two dimensions of performance.

Innovativeness is closely related to features. High-end cars often include advanced technologies—global positioning systems, back-up warning systems, and the like—that represent innovativeness on the part of the organization developing them. Amazon.com's innovative approach to capturing information about visitors to its site and using that information to customize the site to each customer's preferences allows it to offer a more highly featured service.

**Environmental Performance** Increasing regulation as well as pressure from environmental activists is forcing companies to pay more and more attention to environmental performance as one of the key dimensions along which they understand and deliver against customer requirements.

Environmental performance may apply to the product (or tangible output of a service) itself, or to the process by which that product was made or service delivered. *Design for environment programs* focuses on products and aims to improve the environmental performance (e.g., energy consumption) of the product during its useful life as well as the reusability or recyclability of the product once its useful life is over. Interface, Inc., a provider of modular carpet, broadloom carpet, panel fabrics, and upholstery fabrics, for example, makes sustainability central to its strategy with its stated goal: "To be the first company that, by its deeds, shows the entire industrial world what sustainability is in all its dimensions—people, process, product, place and profits—and in doing so we will become restorative through the power of influence" ([www.interfaceinc.com/](http://www.interfaceinc.com/)). It designs its products to reuse various materials in their production, and to be readily recycled after use.

*Environmental management systems* focus on processes and aim to reduce the environmental impact (e.g., hazardous waste generation) of the processes used to make the products or deliver the services. ISO 14000 and the European Eco-Management & Audit Scheme (EMAS, [www.quality.co.uk/emas.htm](http://www.quality.co.uk/emas.htm)) are but two of several structures or frameworks for firms to follow to improve environmental performance. Thus, one might assess the environmental soundness of a product or of the process used to make a product or service.

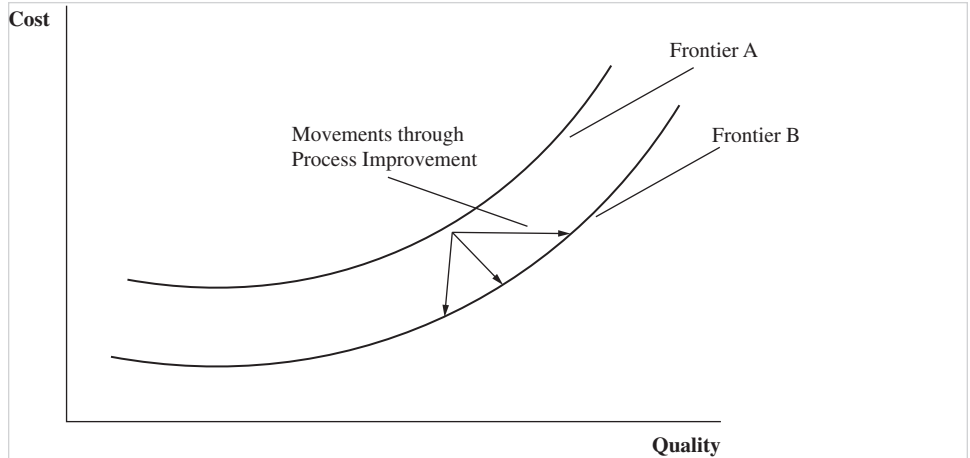
### *Market Positioning and Making Tradeoffs*

As business strategists examine the market segments in which they choose to compete, they decide where they want to be positioned along each of these five dimensions—cost, quality, availability, features, and environmental performance. Axcelis Technologies, for example, places strong emphasis on its technology and the resultant feature set it will be able to offer to its customers both in terms of how its products will perform technically as well as how well they support the overall process of manufacturing semiconductors. Quality, particularly in terms of product performance and reliability over the life of the product, is also critical. While Axcelis places great emphasis on delivering new technologies to its market quickly, it does not offer them off-the-shelf. Instead, customers accept a certain lead-time to receive their customized products. Customers do expect predictability in those lead times, as they expect to be able to install the equipment when planned. Axcelis emphasizes cost of ownership, not just purchase price, for its customers, as it provides solutions to maximize the uptime, throughput, and yield of its customers' processes. And, Axcelis worries about the environmental performance of its products, as its customers are concerned about the environmental performance of the production processes in which they employ Axcelis equipment.

There are tradeoffs inherent in managing performance along each of these five dimensions. Some suggest, for example, that the greater the number of innovative features in a product, or the higher its functionality, the more costly it will be. Others suggest that the more highly customized a product is to a particular customer's specifications, the longer the lead-time to provide the product will be. Great disagreement exists both in the academic literature and in practice about the true nature of the tradeoffs. There is evidence that companies trade off cost with quality, cost with degree of customization, and cost with delivery (availability), but that other types of tradeoffs vary by type of organization. Batch facilities trade off cost with delivery, while continuous flow shops that make higher volumes of more standardized products trade off quality with customization. The reverse is not true, as batch shops do not trade off quality and customization, nor do continuous flow shops trade off cost and delivery (Safizadeh et al. 2000). Nonetheless, there are a few issues on which there does seem to be agreement (Da Silveira and Slack 2001):

- Tradeoffs do exist and are dynamic, and their relative importance and sensitivity vary among companies.
- Tradeoffs are seen as compromises primarily between competitive objectives such as cost, quality, availability, features, and environmental performance, though other types of tradeoffs, such as those among the various functional groups in an organization, also exist.
- The *importance* of tradeoffs is determined by external—market and strategy—factors. But, some tradeoffs are seen by managers as existing more in people's perceptions than in reality.

### EXHIBIT 1.11 Tradeoffs and Performance Frontiers



- The *sensitivity* of tradeoffs is determined by internal variables—resources, capabilities, and attributes—and different tradeoffs may have common or similar sources.
- Tradeoffs are easier to visualize in less complex systems.

Much of the literature on tradeoffs suggests that one can improve but not eliminate tradeoffs (Hayes and Pisano 1996). This literature pictures a series of performance frontiers as shown in Exhibit 1.11 that reflect the tradeoffs inherent in the business but allow for improved performance over time.

In this case, the firm trades off cost and quality but can invest in improvements to its processes that allow it to shift from Frontier A to Frontier B where it still trades off cost and quality, but with better overall performance. It might improve cost performance with no change in quality, quality performance with no change in cost, or achieve some improvement in each. Investments in lean manufacturing techniques, for example, are thought to allow companies to move their performance frontiers and thus lessen the effects of making tradeoffs. Thus, there is value in questioning the validity of tradeoffs and in understanding opportunities for improving performance along multiple dimensions simultaneously. Rather than make tradeoffs among static performance dimensions, business strategists must think through the dynamics of tradeoffs over time as they are affected by the development and exploitation of superior capabilities.

We integrate these concepts into our developing model of business strategy in Exhibit 1.12. Now firm positioning is considered not only in the context of the firm's own industry but also in the context of those firms whose products or services complement the firm's own offerings. Firm positioning also embeds a deep understanding of what customers want in terms of cost, quality, availability, features, and environmental performance.

### Functional Strategy

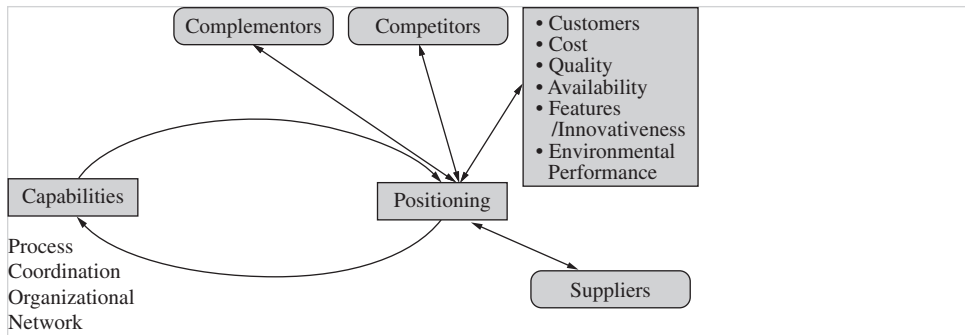
Functional strategies are the sets of decisions made in each of the functional areas of an organization that determine how it will play in the overall business strategy of the firm. Marketing managers make decisions about product and service positioning, advertising and promotion, and customer relationship management. Research and development managers

Exhibit 1.11

Exhibit 1.12

**EXHIBIT 1.12**

**Strategy-Making Process in System Context**

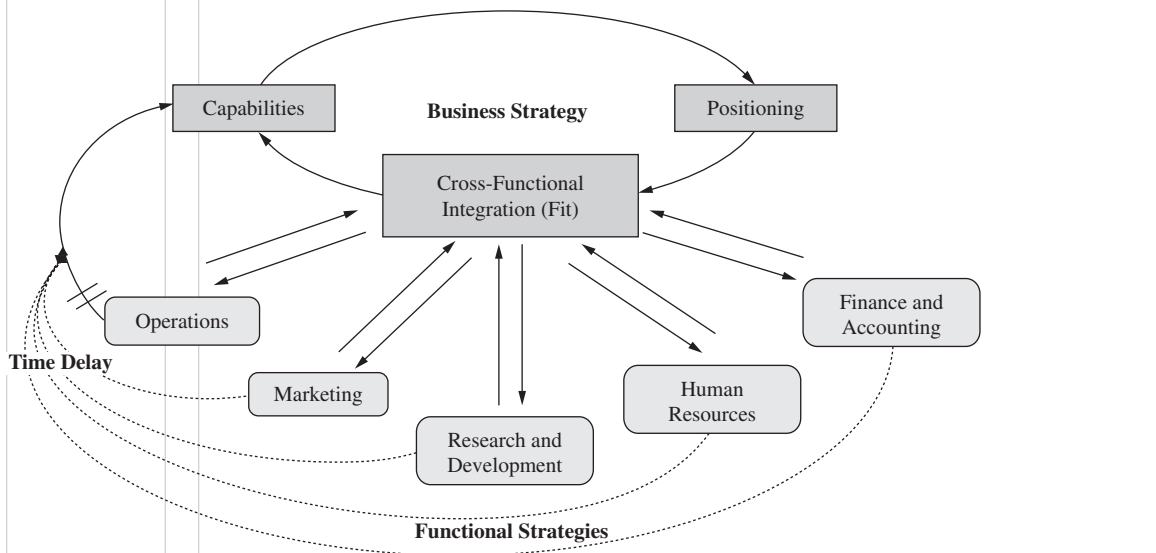


make decisions about technology use, engineering resource allocation, product development process, research and development skills and organization, product prototyping and testing approaches, and involvement of customers in product development. Human resource managers make decisions about organizational structure, workforce skill management, hiring and firing policy, reward and evaluation system, and pay. Finance and accounting managers make decisions about sources of funding, resource allocation, accounting principles, currency hedging, and internal auditing structure.

Collectively, the decisions made in these various functions make up the overall business strategy of the organization. Successful companies drive synergistic decision-making among the functions in support of an overall business strategy and leverage cross-functional capabilities to create and/or support business strategy direction. Exhibit 1.13 integrates this concept in our strategy framework and inserts the strategists' notion of "fit". Each individual functional area may develop its own capabilities that in turn serve the business strategy, or the functional areas may work in concert with one another to create overarching

Exhibit 1.13

**EXHIBIT 1.13 Strategy-Making Framework**



	<p>capabilities. A business strategy is best supported, or created, when the activities undertaken by the functional areas and/or the capabilities they develop complement one another and work together to achieve the goals of the business (Fine and Hax 1985). We refer to this requirement as cross-functional integration or fit.</p> <p>While the focus of this text is on the decisions made by operations managers about strategic operations issues, we nonetheless emphasize the need for operations managers to work with their functional counterparts in developing, creating, and supporting overall business strategy. Throughout the book we will emphasize the relationship between operations and the new product or service development organization, as these two functions must work closely to develop and deliver successful products and services. With this background on strategy-making, and the fit among corporate, business, and functional strategy, we now turn to a specific discussion of operations strategy, the topic of the remainder of this book.</p>
<p>Operations Strategy</p>	<p>Operations strategists respond to the requirements of the business strategy by setting their own performance targets or goals. They also contribute to the business strategy by developing and exploiting capabilities that allow the business to perform in the areas critical to customers, enter new markets, or exploit new opportunities (Skinner 1969 and 1974). Here we describe the operations goals that follow from the dimensions of performance for the business strategy, the set of decisions operations strategists make, and the way in which these goals and decisions play together in a coherent operations strategy.</p> <p><b>Operations Strategy Goals</b></p> <p>Exhibit 1.14 shows the five dimensions of customer requirements and maps them against operations performance measures. In each case, operations can affect some, but not all, of the firm's performance along that dimension (Fine and Hax 1985).</p> <p><i>Cost</i></p> <p>Operations directly affects the cost of the product or service and thus its purchase price (assuming that products are priced to achieve some profit) through its direct or indirect control of the supply chain. It can also affect the product's cost of ownership through joint efforts with engineering (research and development) and/or marketing in the design of the product or service.</p> <p><i>Quality</i></p> <p>Operations also directly controls the quality of the product or service, again through its direct or indirect control of the supply chain. This is often thought of as a "conformance to specifications" task as operations strives to have all products and services delivered meet the specifications set forth by the developers on behalf of the customers. Operations can also influence the design of a product or service so that it can be produced or delivered with higher quality. It does so, again, in joint efforts with research and development and marketing.</p> <p><i>Availability</i></p> <p>Operations is primarily responsible for the availability of products or services already in the market and often determines make-to-order versus make-to-stock strategies.</p>

**EXHIBIT 1.14**  
**Business and Operations Strategy Performance Dimensions**

Source: Data drawn from Fine & Hax, "Manufacturing Strategy: A Methodology and Illustration," *Interfaces* 15, no. 6 (November-December 1985).

Dimension	Customer Concerns	Operations Influence
Cost	Purchase price Cost of ownership	Costs of Materials Production Delivery Distribution Capital productivity Inventory turnover Design for cost Cost objectives are measured using labor, materials, and capital productivity; inventory turnover; unit cost.
Quality	Tangible characteristics Aesthetics Reliability, durability, and safety Serviceability Intangible characteristics: Competence, courtesy, understanding, and communication Access and security	Quality of Materials Production Delivery Distribution Design for quality Quality measures include percent defective or rejected, frequency of failure in the field, cost of quality, and mean time between failures.
Availability	For purchase: Off-the-shelf or make-to-order Of new products: Rapid cycle or planned evolution Variety of range of products available: Degree of customization	Availability Timeliness of delivery of product or service Ability to respond to volume fluctuations Timeliness of new product introductions Delivery performance is measured by percentage of on-time shipments, average delay, expediting response time. Flexibility is measured by product mix and range, volume, and lead time for new products.
Features/ innovativeness	Inherent characteristics of a product or service Degree of innovation	Process capability Capabilities for more featured and innovative products and services Process knowledge and ability to extend it Design and development capabilities Measures of process capability assess the types of products or services that can be delivered.
Environmental performance	Degree to which process that produces and delivers the product or service is environmentally sound Degree to which the product or service itself is environmentally sound and reusable or recyclable	Environmental performance Managing environmental performance of suppliers or other partners in the supply chain Managing the environmental performance of internal production or service delivery operations Environmental performance measures include both emissions measures (water, air, and solid waste) as well as measures of product reuse and recyclability.

Footnote 4

Operations' flexibility<sup>4</sup> and process knowledge are critical in determining both the variety of features and the availability an organization can offer. The ability of operations to control the supply chain and the timeliness with which products or services can be delivered directly affect availability. The determination of how much flexibility operations can offer is a joint decision with marketing and research and development.

#### *Features/Innovation*

Generally, features are the purview of the marketing and research and development organizations, although the operations function is influential in determining the range of products, services, or features the firm will be able to provide based on its own ability to deliver them. Process knowledge and innovation are key to the organization's ability to customize output to specific customer needs, to embed new innovations, and to allow research and development to create novel products and services.

#### *Environmental Performance*

Finally, operations own the environmental performance of both internal and external operations throughout the supply chain. It either works with suppliers to achieve adequate environmental performance in their facilities or works to achieve it in internal operations or both. Operations may also influence research and development to design products that are more environmentally sound (e.g., easier to disassemble and recycle).

#### *Operations Goals in Practice*

Researchers have identified many alternative categorizations of these operations performance dimensions over the years (Dangayach and Deshmukh 2001). Some identify many categories such as the following 11: low cost, design flexibility, volume flexibility, quality conformance, product performance, speed of delivery, dependability of deliveries, after-sales service, advertising, broad distributions and broad product line (Miller and Roth 1994). Others summarize the characteristics in fewer categories defined as follows (Spring and Boaden 1997):

- Cost: production and distribution of product (or service) at low cost
- Quality: manufacture or delivery of product or service with high quality or performance standards
- Delivery dependability: meet delivery schedules
- Delivery speed: react quickly to customer orders to deliver fast
- Flexibility: react to changes in product, changes in product mix, modifications to design, fluctuations in materials, and changes in sequence.

Yet others link clusters of operations performance characteristics into stylized business strategies such as those of caretaker, marketer, and innovator (Miller and Roth 1994).

<sup>4</sup> Some (Hayes and Wheelwright 1984) include flexibility as one of the dimensions of operations performance. We prefer dimensions that more directly reflect *customer* needs or requirements. Flexibility need not be the cornerstone of product differentiation since it is most often of direct benefit to the producer rather than the customer. A firm may, for example, provide product or service differentiation in expensive ways such as by carrying considerable inventories. For this reason, we think of flexibility as an operations capability that can enhance or enable a differentiation strategy rather than serving as the sole basis of differentiation (Ward et al. 1996).



Some researchers have examined similarities and differences in emphasis on these performance categories by industry, by geography, and over time. One study, for example, found that computer and electronics companies rate high product quality as their most important competitive factor, but computer companies rate innovative features and designs more highly than do electronics companies, while electronics companies place more emphasis on short lead times than do computer companies (Lau 2002). Others have found important differences among various countries or geographies in the emphasis they place on these characteristics. After achieving a high level of quality, for example, Japanese manufacturers turned their focus to time-based competition and innovative products, while the U.S. and Europe continued to rank quality as a critical objective (Kenney and Florida 1993). The Manufacturing Futures Survey, which collected longitudinal data over many years, found that lasting improvements in manufacturing can only be achieved by first building quality, followed by delivery reliability, then flexibility and responsiveness, and then technological leadership. At each step of the progression, cost efficiency is pursued for the given capability set, culminating with an overall focus on cost leadership (Roth et al. 1989, Miller et al. 1989).

### Operations Decision Categories

Creating an operations strategy essentially entails making a set of decisions about the structure and infrastructure of operations (Exhibit 1.15) (Skinner 1969, Hayes and Wheelwright 1984). Structural decisions deal with the vertical integration of the operations, its facilities, capacity, and process technology, whereas infrastructure decisions focus on organizational and human resource policies, sourcing and supply chain management practices, quality management systems, planning and control systems, and information technology. Infrastructure is developed over time through persistent day-to-day practice, top management commitment, and cross-functional efforts to create capabilities that support and leverage the firm’s structure. Infrastructure decisions usually deal with less tangible outcomes than do structural decisions, but it is the effective integration and synthesis of structural and infrastructural decisions that create long-term operations excellence (Dangayach and Deshmukh 2001).

In making decisions in each of these categories, operations managers strive to ensure that the decisions are mutually supportive and consistent with one another. Further, they aim to

Exhibit 1.15

**EXHIBIT 1.15**  
**Operations**  
**Strategy**  
**Decision**  
**Categories**

Structural Decisions	Infrastructural Decisions
Vertical integration Process technology Capacity Facilities	Sourcing Information technology Supply chain coordination Business processes and policies Product and service generation Order fulfillment Service and support Workforce and organizational design Capabilities development Lean operations Quality Flexibility

have the collection of decisions support or facilitate the overall business strategy. We describe each of the decision categories briefly here. Each is the subject of a chapter of the book.

### *Structural Decisions*

**Vertical Integration** Vertical integration decisions answer questions about how much of the value chain a firm should own. Should they own more or less of the value chain reaching back to their suppliers? Should they own more or less of the value chain reaching forward to their customers? Issues considered include cost of the business to be acquired or entered; degree of supplier reliability; the proprietary or nonproprietary nature of the product or process to be brought in-house; transaction costs of contracting through market versus nonmarket mechanisms; and impact on risk, product quality, cost structure, and degree of focus. Chapter 2 will address these questions.

**Process Technology** Process technology decisions relate to the firm's investment in the technology it uses to transform materials and/or information into products and/or services. Evaluation of this investment requires a firm to address several questions: Should its process be more labor intensive or more automated? Should it purchase technology or develop it in-house, or use some combination thereof? Should it be a follower or a leader in process technology investment? How does its process technology investment fit with its product technology development strategy? Chapter 3 addresses these questions.

**Capacity** Capacity decisions establish how much capacity the firm will carry in order to manage both short-term fluctuations in demand and longer-term growth opportunities. Capacity may be added gradually or in large chunks. How should the firm deal with cyclical demand? Should the firm add capacity before it is needed, as it is needed, or after it is needed? Different types of capacity may be added at different times. How should the firm use capacity to influence its competitors' decisions or actions? Decisions about capacity are covered in Chapter 4.

**Facilities** Facilities decisions are often closely related to capacity decisions, as firms may add or close facilities in response to a need for more or less capacity but are often longer-term. In thinking through its facilities decisions, a firm will answer questions about how many facilities it should have, where they should be located, and what they should do. Facilities issues become even more crucial in a global environment as firms decide whether to locate facilities near local market to increase share in that market, to access local technologies, to reduce costs, or to leverage local talent. These decisions are the focus of Chapter 5.

### *Infrastructural Decisions*

**Sourcing** Sourcing decisions follow closely from vertical integration decisions. Once a firm has decided not to own certain parts of its value chain, it must determine what types of relationships it should have with the entities outside the boundaries of the firm. Should the suppliers be managed with the five-forces competitive-strategy framework suggested by Porter in this chapter, or with the more cooperative approach modeled by the Japanese keiretsu? Chapter 6 will address these questions.

**Business Processes and Policies** Business processes, such as product and service generation, order fulfillment, and service and support, cut across functional boundaries in an organization and are critical in serving the customer. Business process decisions include determining and defining critical processes, setting performance goals for each,

and then choosing an appropriate organizational design to meet those goals. Some of the organizational design questions include: How should the operations organization be structured? What are the roles of the line and staff organizations? What skills are required in operations? How should those skills be developed and retained? How should operations personnel be rewarded? Chapter 7 focuses on business processes and on the workforce and organizational design as it supports a business process focus.

**Supply Chain Coordination** While business process management focuses inside the organization, operations management today often requires management of multiple sources, markets, and flows outside the firm as well. Thus, operations managers face strategic decisions about the structure of the supply chains in which they operate and choices of policies with which to operate those supply chains. Should they co-locate their own operations with those of their suppliers? How many layers should they have in their distribution networks? What modes of transportation are appropriate for which links in the supply chain? How should flows of goods among the various entities in the supply chain be monitored? These and other questions are the subject of Chapter 8.

**Information Technology** Information technology and process technology decisions are closely related, but process technology decisions relate to the physical equipment with which products and services are made and delivered, while information technology refers to the system that moves information around the operations function, between operations and the other functional areas in the firm, and among the players in the broader supply chain. There are a number of decisions operations managers make about their information technology. How automated should information processing be? Should information systems be purchased or developed internally? Should the firm be a follower or a leader in the development and/or use of state-of-the-art technology? How does the information technology investment fit with other investments the firm is making? These questions are the subject of Chapter 9.

**Operations Capabilities Development** There is some evidence that traditional operations improvement programs such as lean manufacturing, just-in-time, total quality management, focused factories, and the like are misused by managers. Often hastily adopted as an industry best practice or in emulation of a competitor, these programs can yield poor results, wasted effort, and missed opportunities for an organization. When thoughtfully and fully implemented, however, they can be enormously successful. In developing operations strategy, managers must examine such programs and consider the capabilities required to develop and implement them. In Chapter 10, we examine three such programs—lean operations, quality management and flexibility—and the implications of investing in their development and implementation.

## Consistency and Contribution

The concept of consistency or fit in strategy development and implementation is strongly influenced by the population ecology school of thought. It emerged as one of the foremost concepts in the strategic management and organizational theory literature in the particular context of contingency theories linking context or environment, industry and firm structure and performance. This literature suggests that the critical elements to be aligned are (a) internal to the firm, where the *implementation* of strategy focuses on obtaining fit between the strategy and the organizational structure, (b) external to the firm, where the

strategy *formulation* process seeks a fit between the firm's strategy and the environment in which it operates, and (c) internal-external fit, where the *formulation* and *implementation* of strategy are considered to be interactive elements (Nath and Sudharshan 1994).

Business strategy is "integrated actions in the pursuit of competitive advantage" with functional strategies as the supportive activities essential for translating the core strategy into an effective guide for action (Day 1984). To be effective, each functional strategy must support the competitive advantage sought, through a specific and consistent pattern of decisions (Hayes and Wheelwright 1984). Just as there is good integration between the business strategy and the functional strategies, there must be consistency and fit among the key elements of an operations strategy as well. The key decisions made in developing an operations strategy must be consistent both internally, in that the decisions made in the various categories (vertical integration, process technology, capacity, facilities, sourcing, business processes and policies, supply chain coordination, information technology, and operations capabilities development) are mutually supportive, and externally, in that the collective set of decisions supports the overall business strategy.

Good operations strategies also contribute to business strategy, directing attention to new business opportunities and providing the needed capabilities to execute them. The philosophy of strategic choice is based on a need to attain internal and external consistency. Failure to match with external business, product, and customer factors can lead to a mismatch with the market and consequently erosion of market share (Chatterjee 1998).

Nucor Steel is an excellent example of a company that has a highly consistent operations strategy that has contributed significantly to the company's business strategy and success over the years. Nucor started as a joist manufacturing company. It developed manufacturing capabilities that it thought it could apply in steel making, and backward integrated to ensure a steady supply of steel for its joist products. It soon learned that its capability to make low cost steel could be leveraged in the steel market itself, and it began selling steel, thus launching a business that has grown steadily over many years. Its operations strategy thus facilitated entering new businesses.

Nucor's operations strategy is also highly internally consistent. Nucor locates, for example, in rural areas (facilities strategy), that allows it to use nonunion labor (business policy) that allows it to use employees flexibly throughout the facility, thus engendering communication, sharing, and innovation (operations capability). Nucor not only fulfills its own internal requirements for steel, but sells on the outside (capacity strategy), which allows it to sustain a productivity-based incentive program (business policy) that creates an environment of learning and continuous improvement (organizational capability). Nucor buys standard off-the shelf equipment but applies engineering skills (business policy) to that equipment to have it run over rated capacity (process capability) in many cases.

Operations strategy requires understanding the implications of the business strategy for performance in cost, quality, availability, features/innovativeness, and environmental performance. It then requires making structural decisions about degree of vertical integration, size, location, and focus of facilities, what types of capacity to add, and when, and what types of process technology are needed. It also requires the development and exploitation of capabilities in cross-functional process management, sourcing and supply chain management, quality and flexibility management, and lean operations as well as appropriate investments in information technology. The development of these capabilities and the structural choices must be made in a way such that they are consistent with one another, with the

other functional strategies, and with the business strategy of the firm. Over the years, this has been expressed succinctly by various authors in different ways. Operations strategy is

- Exploiting certain properties of the operations function as a competitive weapon (Skinner 1969)
- A consistent pattern of decision making in the operations function which is linked to the business strategy (Hayes and Wheelwright 1984)
- A coordinated approach, which strives to achieve consistency between functional capabilities and policies for success in the marketplace. (Hill 2000)
- A tool for effective use of operations' strength as a competitive weapon for achievement of business and corporate goals (Swamidass and Newell 1987)
- A collective pattern of decisions that acts upon the formulation and deployment of operations resources. To be most effective, the operations strategy should act in support of the overall strategy directions of the business and provide for competitive advantage (Cox and Blackstone 1998).

## Summary: Operations Strategy in Its Business Strategy Context

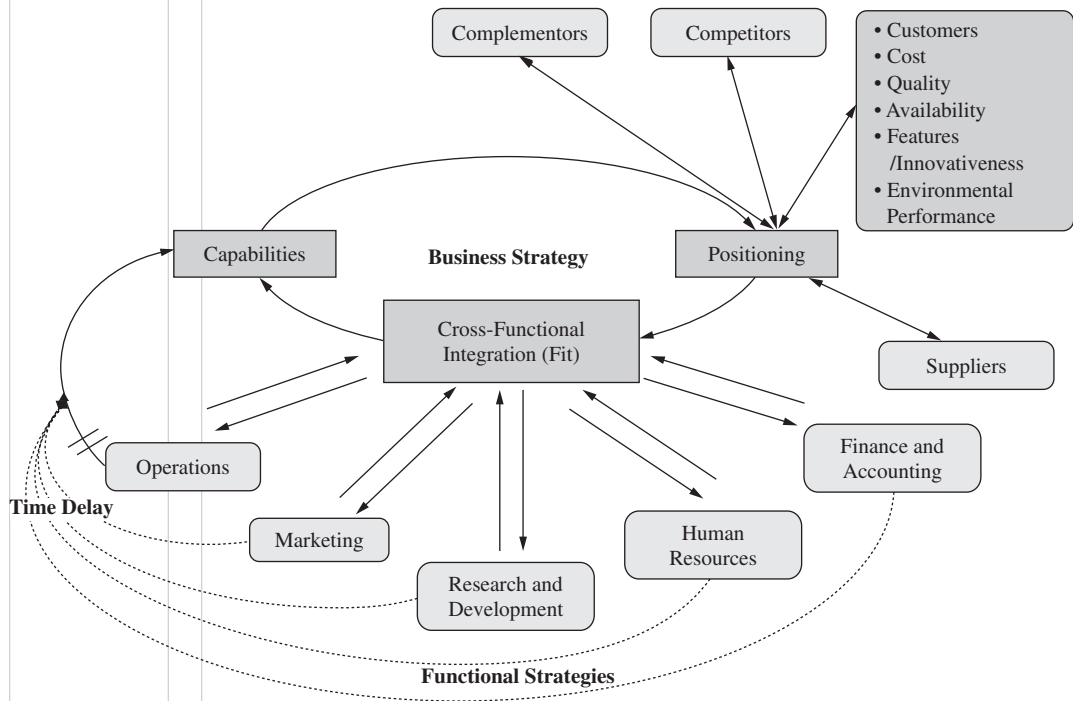
Strategy is about deciding where you want your business to go and figuring out how to get there. It entails balancing controlled or planned actions (intended/deliberate strategy) with uncontrolled or unplanned patterns of actions (emergent strategy). Operations strategy is developed in the context of both corporate and business strategy. Corporate strategy dictates what businesses an organization will be in, while business strategy determines the market segments in which the business will compete; the partnerships it will leverage in providing solutions to its customers; and the sources of competitive advantage in terms of cost, quality, availability, features/innovativeness, and environmental performance the firm will gain in each segment. The process of developing an operations strategy requires substantial analysis of the market in which the firm operates as well as technical understanding of the operations. Operations strategists must understand the evolution of the industry over time, detect changes in the structure of the industry, and identify competitive challenges and opportunities. Two important sources of information involve benchmarking competitor performance from a customer perspective to reveal standards, gaps, and opportunities and benchmarking competitors' practices to understand how current performance levels are being met and find ways to challenge accepted practices (Bennigson 1996). These activities must be undertaken with open-minded inquiry and thoughtfulness about the appropriate framing of the industry boundaries and opportunities.

Exhibit 1.16

The highly iterative process of strategy-making, summarized in Exhibit 1-16, entails *understanding what position the firm wants to, or can, take in the marketplace, which in turn requires deep understanding of*

- Competitors within the industry
- Suppliers to the industry
- Complementary product or service offerings and the firms offering them
- Spaces outside the industry into which the firm might expand
- Customers and what they want in terms of:
  - Cost

**EXHIBIT 1.16** Integrated Strategy-Making Framework



- Quality
- Availability
- Features/innovativeness
- Environmental performance

Methodologies such as conjoint analysis and market segmentation that have not been traditionally applied to operations are increasingly understood to provide important insights into the positioning question and thus into the operations strategy development process (Berry et al., 1991).

The process of strategy-making also entails *understanding what capabilities the firm has to offer or can or should develop both within and across the key functional areas of the firm:*

- Operations
- Marketing
- Research and development
- Human resources
- Finance and accounting

It is the understanding, development, and application of capabilities that is thought to provide the greatest opportunity for strategic advantage in today's markets.

Strategy-making further entails *integrating or synthesizing the activities and capabilities of the functions to achieve a coherent strategy of fit in support of a desired strategic direction, or in pursuit of a new strategic direction.*

Product and service realization start with research and development; include design engineering, procurement, and production; and culminate with distribution, customer service, and warranty management. Thus, operations strategy cannot focus solely on operations-related issues but must encompass the entire chain (Skinner 1996) and support substantial cross-functional analytical, problem-solving, and design activity.

Operations strategy, as one of the functional strategies that support or make up the business strategy, both executes the business strategy and contributes to it.

- Operations managers make decisions about vertical integration, sourcing, capacity, facilities, process technology, information technology, business processes, operations capabilities, and supply chain management to support the business strategy. Specifically, they make decisions in these categories that allow the firm to achieve its desired *position* in the eyes of its customers in terms of cost, quality, availability, and features.
- Operations managers not only respond to the needs of the market as expressed through the business strategy, but they contribute to the creation of the business strategy through investment in capability development both within operations itself as well as with operations' functional counterparts. The continuous improvement of *operations capabilities* creates new business opportunities to be considered by the business strategists.
- Operations managers work closely with their functional counterparts in marketing, research and development, human resources, and finance/accounting to ensure that the decisions they make and capabilities they develop are not only *consistent* but also mutually reinforcing. Often they work together on overarching decisions such as vertical integration, information technology, new product management, and supply chain management decisions, to ensure that the best possible *fit* of decisions is made to support the business strategy.

The strategic decision-making process plays a critical role in the success of world class operations (Dangayach and Deshmukh 2001). World class firms place a formal emphasis on strategic planning, communicate strategy to all stakeholders, have a long-term orientation, and are clear about the strategic role of operations in their strategy. These organizations also stress continuous improvement efforts, supplier-customer integration, development of human resources, and proper alignment and use of information technology.

Strategy entails more than just finding and emulating best practice. It requires firms to search out new practices by exploring questions such as “What if our competitor had new capabilities with which it could attack our company at its weak points?” and “How would we respond if we were attacked?” It entails seeking out and studying fast-growing competitors to learn about the innovative operational methods they have developed (Hayes and Upton 1998). And, it may entail looking beyond the traditionally defined boundaries of the industry to seek new opportunities. Instead of focusing on existing competitors and ways to beat them according to the rules of the currently defined game, companies may seek growth opportunities that require expansion of the bounds of the industry or redefinition of the rules of the game. Only 14% of new business launches look for such game-changing opportunities but derive 38% of their revenue and 61% of their profits from having done so (Kim and Mauborgne 2005).

Conventional planning operates on the premise that managers can extrapolate future results from a well-understood and predictable platform of past experience. Companies adhering to conventional planning practices are often subject to the following errors in planning (McGrath and MacMillan 1995):



1. The company has little or no hard data but, once a few key decisions are made, proceeds as though its assumptions were facts.
2. The company has all the hard data it needs to check its assumptions but fails to see the implications of incorrect assumptions.
3. The company possesses all the data it needs to determine that a real opportunity exists but makes implicit and inappropriate assumptions about its ability to implement.
4. The company starts off with the right data but implicitly assumes a static environment and thus fails to notice that a key variable has changed until it is too late.

“Discovery-driven planning” systematically converts assumptions into knowledge as a strategic venture unfolds using such tools as (McGrath and MacMillan 1995)

1. Reverse income statements that model the basic economics of the business and start with required profits.
2. Pro forma operations specs which lay out all the activities required to produce, sell, service, and deliver product or service to the customer and then use industry standards to build a realistic picture of what the business has to look like to be competitive. They spell out clearly and realistically where the venture will have to match existing industry standards and in what one or two places managers expect to excel and how they expect to do so.
3. Key assumptions checklist which is used to ensure that assumptions are flagged, discussed, and checked regularly as the venture unfolds.
4. Milestone planning chart which specifies assumptions to be tested at each project milestone. Postpone major commitments of resources until evidence from the previous milestone event signals that the risk of taking the next step is justified.

For operations managers to participate in the radical reinventions that can emerge from these processes, they must engage in revolutionary rather than evolutionary change in many cases. Continuous improvement (evolution), like the benchmarking of best practices, is a prerequisite for success in a competitive world. But incremental change is not sufficient when competitive conditions or new market opportunities dictate a redeployment of operations resources. Successful redeployment of operations resources requires rapidly and simultaneously (Bennigson 1996)

- Changing the mind-set of people in the firm about customer needs, competitive standards, what operations policies and practices are possible or feasible, and how operations should work.
- Changing the strategy itself and specifically how resources are deployed for technology, capacity, vertical integration, and global facilities as well as for the internal development of skills, values, and organizational capabilities and the external supply network for products and services.
- Changing the actions people take from day-to-day as they identify priorities and solve problems, develop and manage working relationships both within operations and among the functions.

Because of the comprehensive nature of the changes involved in implementing operations strategy in many cases, implementation program teams must pay close attention to gaining understanding and buy-in at every level of the organization and make a heavy investment in communication throughout the process (Bennigson 1996).

At Axcelis, operations play a critical role in the achievement of the company's business objectives: technology leadership, operational excellence, and customer partnerships. Operations managers have carefully balanced decisions to outsource noncritical activities with the need to reliably deliver leading-edge technology to the marketplace. Through implementation of lean manufacturing concepts throughout the supply chain, they have reduced costs and increased the flexibility of the organization to respond to downturns in the economy. Investments in information technology have brought them closer to their customers. These decisions, made by operations managers about the allocation and use of operations resources, have both implemented the Axcelis business strategy and supported the development of additional capabilities to be leveraged in the future. Making these decisions and achieving these performance outcomes is what this book is all about.

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