We begin our discussion of the role of operations in the organization by examining how global competition drives organizations to define a strategy for survival and then execute on that strategy through efficient and effective operations. Chapter 1 describes the global competitive scene, what customers value, the evolution of strategy and supporting functional strategies, some strategic frameworks used in operations, and the organization's production system that executes that operations strategy. The chapter ends with a description of how the remaining chapters in the text all derive from the operations strategy.
CHAPTER 1

Operations Strategy and Global Competitiveness

1. Operations Strategy and Global Competitiveness

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INTRODUCTION

It is not well known that the Kmart and Wal-Mart chains both date back to 1962. By 1987 Kmart was clearly dominating the discount chain race, with almost twice as many stores and sales of $25.63 billion to Wal-Mart’s $15.96 billion. However, for the retail year that ended in January 1991, Wal-Mart had overtaken Kmart, with sales of $32.6 billion to Kmart’s sales of $29.7 billion. Interestingly, although Wal-Mart had taken the lead in sales in 1991, it still had fewer stores—1721 to Kmart’s 2330. By the 2000 retail year, Wal-Mart had clearly established itself as the dominant discount chain, with sales of $188.1 billion to Kmart’s $36.4 billion. Perhaps equally telling is the shift in market share experienced by these two companies. For the period from 1987 to 1995, Kmart’s market share declined from 34.5 percent to 22.7 percent, while Wal-Mart’s increased from 20.1 percent to 41.6 percent.

What accounts for this reversal in fortunes? Kmart’s response to the competition from Wal-Mart was to build on its marketing and merchandising strengths and invest heavily in national television campaigns using high-profile spokespeople such as Jaclyn Smith (a former Charlie’s Angel) and Martha Stewart. Wal-Mart took an entirely different approach and invested heavily in operations in an effort to lower costs. For example, Wal-Mart developed a companywide computer system to link cash registers to headquarters, thereby greatly facilitating inventory control at the stores. Also, Wal-Mart developed a sophisticated distribution system. The integration of the computer system and the distribution system meant that customers would rarely encounter out-of-stock items. Further, the use of scanners at the checkout stations eliminated the need for price checks. By Kmart’s own admission, its employees were seriously lacking the skills needed to plan and control inventory effectively (Duff and Ortega 1995).

Fast forward to 2004 and Kmart was still having problems with getting merchandise on its shelves (Turner 2003, Duff and Ortega 1995, Merrick and Zimmerman 2004). Thus, Kmart adopted a new strategy to compete with Wal-Mart—merging with Sears, Roebuck & Co. in March 2005 to gain potential synergies through cross-selling and other retail sales techniques. The combined entity, known as Sears Holdings Corporation, tried new store formats and concepts but nothing seemed to work. Sears then tried a new approach, acquiring other retailers such as Land’s End, but this strategy also didn’t seem to turn things around. In March 2007, the Washington Post reported (http://en.wikipedia.org/wiki/Sears_Holdings_Corporation) that Sears was being run as a hedge fund, making a substantial portion of its profits on non-retail financial investments. By year-end 2007, Wal-Mart rang up sales of $379 billion (an 8.6% increase over 2006) while Sears sales were $51 billion (a 4.4% decrease), with earnings at Wal-Mart of $12.7 billion, up 12.6 percent, and $0.8 billion at Sears, down 44.6 percent! In terms of total stores, Wal-Mart had 7262 (up 7.1%) while Sears stayed at 3800 (0%). According to SAP’s July 2008 Top 100 Retailers special report: “Sears hasn’t turned the corner yet but not for lack of trying different things; the
Introduction

national economy hasn't helped, but many of the company's maneuvers have yet to pay off" (SAP 2008).

• In the early 2000s, GM's Chairman and CEO, Richard Wagoner Jr., relied on the strategy of using rebates to help generate cash and reverse GM's long, downward decline in market share from about 45 percent in 1980 to about 30 percent. In the highly competitive auto industry, maintaining market share is critical. For example, analysts estimate the impact of each percentage point of market share at GM is $1 billion in profits. Unfortunately for GM, as its market share continues to erode, it is becoming increasingly clear that the rebate strategy it pursued over the last several years is not working. A recent indication of this was that in the first two months of 2005, GM's market share declined by over two percentage points to just under 25 percent. Based on this decline, GM projected a loss for the first quarter of 2005 of over $800 million.

A closer examination of GM's situation suggests more fundamental problems. In particular, some analysts have suggested that GM's reliance on rebates is simply a reflection of weaknesses in its product offerings. For example, in 2005 GM had eight brands compared with Toyota's two. Aside from the issue of whether a company with less than 25 percent of the market needed so many brands, one result of having so many brands was a proliferation of similar vehicles across the brands: six similar front-wheel-drive midsize family sedans and four similar minivans. Furthermore, the problem with offering so many models created another problem for GM, namely, that it was unable to redesign its cars as frequently as its competitors. For example, it took GM 9 years to replace its Chevrolet Cavalier with the Cobalt. Honda, on the other hand, completely redesigns its Civic every five years (Welch 2005).

While GM's market share continued to drop to about 20 percent, the entire automotive industry got hit with a powerful one-two punch in 2008, throwing the weakened American automobile producers into chaos. First in early 2008 were extreme gasoline prices which killed the truck and SUV market and then the sudden credit crisis and recession killed the rest of the automobile market. The high cost of debt, unionized labor, and unfunded liabilities (pensions and healthcare) forced GM and Chrysler to go begging to the government for bailouts. By late 2008, they were burning through billions of dollars of cash every month. One industry analyst calculated that GM's obligations in March of 2009 amounted to $62 billion, 35 times its market capitalization (Denning 2009, p. C10)! At this time, it appears that Chrysler may be too far gone to save, and GM will need to go through at least some form of bankruptcy to emerge as a viable company. Although Ford has not asked for government monies, it is also in difficult straits. The future looks tumultuous for the automakers.

• Having rung up combined profits of $8 billion in 2004, manufacturers of flat-panel TVs appeared to be especially optimistic about the profit potential for the TV market in the years ahead. Indeed, a battle of epic proportions was brewing in the consumer electronics industry. On one side was a group of Asian manufacturers that spent $35 billion adding flat-panel capacity in 2004 and 2005. Among the Asian players were a joint venture between LG Electronics and Royal Philips Electronics that invested $5.1 billion to build the world's largest liquid-crystal display factory, a
A great many societal changes that are occurring today intimately involve activities associated with operations. For example, there is great pressure among competing nations to increase their exports. And businesses are intent on building efficient and effective supply chains, improving their processes through “six-sigma,” and successfully applying the precepts of “lean management” and other operations-based programs.
Another characteristic of our modern society is the explosion of new technology, an important aspect of operations. Technologies such as cell phones, e-mail, notebook computers, personal digital assistants, and the Web, to name a few, are profoundly affecting business and are fundamentally changing the nature of work. For example, many banks are shifting their focus from building new branch locations to using the Web as a way to establish and develop new customer relationships. Banks rely on technology to carry out more routine activities as well, such as transferring funds instantly across cities, states, and oceans. Our industries also rely increasingly on technology: robots carry and weld parts together, and workerless, dark “factories of the future” turn out a continuing stream of products. And soft operations technologies, such as “supply chain management” and “lean production” (Feld 2000; Womack and Jones 2003) have transformed world markets and the global economy.

This exciting, competitive world of operations is at the heart of every organization and, more than anything else, determines whether the organization survives in the international marketplace or disappears into bankruptcy or a takeover. It is this world that we will be covering in the following chapters.

Why do we argue that operations be considered the heart of every organization? Fundamentally, organizations exist to create value, and operations involves tasks that create value. Michael Hammer (2004) maintains that operational innovation can provide organizations with long-term strategic advantages over their competitors. Regardless of whether the organization is for-profit or not-for-profit, primarily service or manufacturer, public or private, it exists to create value. Thus, even nonprofit organizations like the Red Cross strive to create value for the recipients of their services in excess of their costs. Moreover, this has always been true, from the earliest days of bartering to the modern-day corporations.

Consider McDonald’s as an example. This firm uses a number of inputs, including ingredients, labor, equipment, and facilities; transforms them in a way that adds value to them (e.g., by frying); and obtains an output, such as a chicken sandwich, that can be sold at a profit. This conversion process, termed a production system, is illustrated in Figure 1.1. The elements of the figure represent what is known as a system: a purposeful collection of people, objects, and procedures for operating within an environment.

Note the word purposeful; systems are not merely arbitrary groupings but goal-directed or purposeful collections. Managing and running a production system efficiently and effectively is at the heart of the operations activities that will be discussed in this text. Since we will be using this term throughout the text, let us formally define it. Operations is concerned with transforming inputs into useful outputs according to the agreed-upon strategy and thereby adding value to some entity; this constitutes the primary activity of virtually every organization.

\footnote{Note the word system is being used here in a broad sense and should not be confused with more narrow usages such as information systems, planning and control systems, or performance evaluation systems.}
Not only is operations central to organizations, it is also central to people’s personal and professional activities, regardless of their position. People, too, must operate productively, adding value to inputs and producing quality outputs, whether those outputs are information, reports, services, products, or even personal accomplishments. Thus, operations should be of major interest to every reader, not just professionally but also personally.

**Systems Perspective**

As Figure 1.1 illustrates, a production system is defined in terms of the environment, a strategy, a set of inputs, the transformation process, the outputs, and some mechanism for controlling the overall system. The strategy includes such elements as what customers value, the vision and mission of the organization, an appropriate framework to execute this vision, and the core capabilities of the organization. We discuss the strategy in detail a bit later. The environment includes those things that are outside the actual production system but that influence it in some way. Because of its influence, we need to consider the environment, even though it is beyond the control of decision makers within the system.
For example, a large portion of the inputs to a production system are acquired from the environment. Also, government regulations related to pollution control and workplace safety affect the transformation system. Think about how changes in customers’ needs, a competitor's new product, or a new advance in technology can influence the level of satisfaction with a production system’s current outputs. As these examples show, the environment exerts a great deal of influence on the production system.

Because the world around us is constantly changing, it is necessary to monitor the production system and take action when the system is not meeting its strategic goals. Of course, it may be that the current strategy is no longer appropriate, indicating a need to revise the strategy. On the other hand, it may be found that the strategy is fine but that the inputs or transformation processes, or both, should be modified in some way. In either case, it is important to continuously collect data from the environment, the transformation processes, and the outputs, compare that data to the strategic plan, and if substantial deviations exist, design and implement improvements to the system, or perhaps the strategy, so that results agree with the strategic goals.

Thinking in terms of systems provides decision makers with numerous advantages. To begin, the systems perspective focuses on how the individual components that make up a system interact. Thus, the systems perspective provides decision makers with a broad and complete picture of an entire situation. Furthermore, the systems perspective emphasizes the relationships between the various system components. Without considering these relationships, decision makers are prone to a problem called *suboptimization*. Suboptimization occurs when one part of the system is improved to the detriment of other parts of the system, and perhaps the organization as a whole. For example, if a retailer decides to broaden its product line in an effort to increase sales, this could actually end up hurting the retailer as a whole if it does not have sufficient shelf space or service personnel available to accommodate the broader product line. Thus, decisions need to be evaluated in terms of their effect on the *entire* system, not simply in terms of how they will affect one component of the system.

In the remainder of this section we elaborate on inputs, the transformation processes, and outputs. In later sections and chapters we will further discuss both strategy and elements of the control system in more detail.

**Inputs**

The set of inputs used in a production system is more complex than might be supposed and typically involves many other areas such as marketing, finance, engineering, and human resource management. Obvious inputs include facilities, labor, capital, equipment, raw materials, and supplies. Supplies are distinguished from raw materials by the fact that they are not usually a part of the final output. Oil, paper clips, pens, tape, and other such items are commonly classified as supplies because they only aid in producing the output.

Another very important but perhaps less obvious input is knowledge of how to transform the inputs into outputs. The employees of the organization hold this knowledge. Finally, having sufficient time to accomplish the operations is always critical. Indeed, the operations function quite frequently fails in its task because it cannot complete the *transformation activities* within the required time limit.
Transformation Processes

The transformation processes are the part of the system that adds value to the inputs. Value can be added to an entity in a number of ways. Four major ways are described here.

1. Alter: Something can be changed structurally. That would be a physical change, and this approach is basic to our manufacturing industries where goods are cut, stamped, formed, assembled, and so on. We then go out and buy the shirt, or computer, or whatever the good is. But it need not be a separate object or entity; for example, what is altered may be us. We might get our hair cut, or we might have our appendix removed.

Other, more subtle, alterations may also have value. Sensual alterations, such as heat when we are cold, or music, or beauty may be highly valued on certain occasions. Beyond this, even psychological alterations can have value, such as the feeling of worth from obtaining a college degree or the feeling of friendship from a long-distance phone call.

2. Transport: An entity, again including ourselves, may have more value if it is located somewhere other than where it currently is. We may appreciate having things brought to us, such as flowers, or removed from us, such as garbage.

3. Store: The value of an entity may be enhanced for us if it is kept in a protected environment for some period of time. Some examples are stock certificates kept in a safe-deposit box, our pet boarded at a kennel while we go on vacation, or ourselves staying in a hotel.

4. Inspect: Last, an entity may be more valued because we better understand its properties. This may apply to something we own, plan to use, or are considering purchasing, or, again, even to ourselves. Medical exams, elevator certifications, and jewelry appraisals fall into this category.

Thus, we see that value may be added to an entity in a number of different ways. The entity may be changed directly, in space, in time, or even just in our mind. Additionally, value may be added using a combination of these methods. To illustrate, an appliance store may create value by both storing merchandise and transporting (delivering) it. There are other, less frequent, ways of adding value as well, such as by “guaranteeing” something. These many varieties of transformations, and how they are managed, constitute some of the major issues to be discussed in this text.

Outputs

Two types of outputs commonly result from a production process: services and products. Generally, products are physical goods, such as a personal computer, and services are abstract or nonphysical. More specifically, we can consider the characteristics in Table 1.1 to help us distinguish between the two.

However, this classification may be more confusing than helpful. For example, consider a pizza delivery chain. Does this organization produce a product or provide
a service? If you answered “a service,” suppose that instead of delivering its pizzas to
the actual consumer, it made the pizzas in a factory and sold them in the frozen-food
section of grocery stores. Clearly the actual process of making pizzas for immediate
consumption or to be frozen involves basically the same tasks, although one may be
done on a larger scale and use more automated equipment. The point is, however,
that both organizations produce a pizza, and defining one organization as a service
and the other as a manufacturer seems to be a little arbitrary. In addition, both prod-
ucts and services can be produced as commodities or individually customized.

We avoid this ambiguity by adopting the point of view that any physical entity
accompanying a transformation that adds value is a facilitating good (e.g., the
pizza). In many cases, of course, there may be no facilitating good; we refer to these
cases as pure services.

The advantage of this interpretation is that every transformation that adds value is
simply a service, either with or without facilitating goods! If you buy a piece of lum-
ber, you have not purchased a product. Rather, you have purchased a bundle of
services, many of them embodied in a facilitating good: a tree-cutting service, a saw
mill service, a transportation service, a storage service, and perhaps even an adver-
tising service that told you where lumber was on sale. We refer to these services as
a bundle of “benefits,” of which some are tangible (the sawed length of lumber, the
type of tree) and others are intangible (courteous salesclerks, a convenient location,
payment by charge card). Some services may, of course, even be negative, such as
an audit of your tax return. In summary, services are bundles of benefits, some
of which may be tangible and others intangible, and they may be accompa-
nied by a facilitating good or goods.

Firms often run into major difficulties when they ignore this aspect of their opera-
tions. They may think of, and even market themselves as, a “lumberyard” and not as
providing a bundle of services. They may recognize that they have to include certain
tangible services (such as cutting lumber to the length desired by the customer) but
ignore the intangible services (charge sales, having a sufficient number of clerks).
Another reason for not making a distinction between manufacturing and services is
that when a company thinks of itself as a manufacturer, it tends to focus on meas-
ures of internal performance such as efficiency and utilization. But when companies
consider themselves as providing services they tend to focus externally and ask
questions such as “How can we serve our customers better?” This is not to imply
that improving internal performance measures is not desirable. Rather, it suggests

<table>
<thead>
<tr>
<th>TABLE 1.1 • Characteristics of Products and Services</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Products</strong></td>
</tr>
<tr>
<td>Tangible</td>
</tr>
<tr>
<td>Minimal contact with customer</td>
</tr>
<tr>
<td>Minimal participation by customer in the delivery</td>
</tr>
<tr>
<td>Delayed consumption</td>
</tr>
<tr>
<td>Equipment-intense production</td>
</tr>
<tr>
<td>Quality easily measured</td>
</tr>
</tbody>
</table>
that improved customer service should be the primary impetus for all improvement efforts. It is generally not advisable to seek internal improvements if these improvements do not ultimately lead to corresponding improvements in customer service and customer satisfaction.

In this text we will adopt the point of view that all value-adding transformations (i.e., operations) are services, and there may or may not be a set of accompanying facilitating goods. Figure 1.2 illustrates how the tangible product (or facilitating good) portion and the intangible service portion for a variety of outputs contribute to the total value provided by each output. The outputs shown range from virtually pure services to what would be known as products. For example, the Plush restaurant appears to be about 75 percent service and 25 percent product. Although we work with “products” as extensively as with services throughout the chapters in this

![Figure 1.2](image-url)  
**Figure 1.2** The range from services to products.
book, bear in mind that in these cases we are working with only a portion of the total service, the facilitating good. In general, we will use the nonspecific term outputs to mean either products or services.

One particular type of output that is substantially different from products and many other types of services is that of knowledge or information. These outputs often have the characteristic that the more they are used, the more valuable they become. For example, in a network the more entities that belong to the network, the more useful it may be. If you are on Facebook® or use email, the more other people that are also there, the more valuable it is to you. And when you share this output, you don’t lose anything, you gain. Some other characteristics of information or knowledge that differ from normal goods and services are listed below.

- giving or selling the information/knowledge to someone doesn’t mean you can’t give or sell it to someone else;
- the information/knowledge doesn’t wear out;
- the information/knowledge isn’t subject to the law of diminishing returns;
- the information/knowledge can be replicated at minimal cost and trouble; and
- the more the knowledge is used, the more valuable it becomes.

Control

Suppose that in our production system we make a mistake. We must be able to observe this through, for example, accounting records (measurement data), compare it to standard to see how serious the error is, and then, if needed, plan and implement (usually via a project) some improvements. If the changes are not significantly affecting the outputs, then no control actions are needed. But if they are, management must intercede and apply corrective control to alter the inputs or the transformation processes and, thereby, the outputs. The control activities illustrated in Figure 1.1 are used extensively in systems, including management systems, and will be encountered throughout this text.

Table 1.2 lists a few examples of some components of the production system for a variety of common organizations.

Operations Activities

Operations include not only those activities associated specifically with the production system but also a variety of other activities. For example, purchasing or procurement activities are concerned with obtaining many of the inputs needed in the production system. Similarly, shipping and distribution are sometimes considered marketing activities and sometimes considered operations activities. Because of the important interdependencies of these activities, many organizations are attempting to manage these activities as one process commonly referred to as supply chain management.

As organizations begin to adopt new organizational structures based on business processes and abandon the traditional functional organization, it is becoming less important to classify activities as operations or nonoperations (e.g., sales, marketing, purchasing). However, to understand the tasks more easily, we divide the field of
TABLE 1.2 • Examples of Production System Components

<table>
<thead>
<tr>
<th>Organization</th>
<th>Strategy</th>
<th>Inputs</th>
<th>Transformation Process</th>
<th>Outputs</th>
<th>Control</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post office</td>
<td>Regular</td>
<td>Labor</td>
<td>Transportation</td>
<td>Mail deliveries</td>
<td>Weather</td>
<td>Transportation network</td>
</tr>
<tr>
<td></td>
<td>Consistent</td>
<td>Equipment</td>
<td>Printing</td>
<td>Stamps</td>
<td>Mail volumes</td>
<td>Weather</td>
</tr>
<tr>
<td></td>
<td>Dependable</td>
<td>Trucks</td>
<td></td>
<td></td>
<td>Sorting/loss errors</td>
<td>Civil service</td>
</tr>
<tr>
<td>Bank</td>
<td>Secure</td>
<td>Checks</td>
<td>Safekeeping</td>
<td>Interest</td>
<td>Interest rates</td>
<td>Federal</td>
</tr>
<tr>
<td></td>
<td>Trustworthy</td>
<td>Deposits</td>
<td>Investment</td>
<td>Electronic transfer</td>
<td>Wage rates</td>
<td>Reserve</td>
</tr>
<tr>
<td></td>
<td>Responsive</td>
<td>Vault</td>
<td>Statement preparations</td>
<td>Loans</td>
<td>Loan default rates</td>
<td>Economy</td>
</tr>
<tr>
<td></td>
<td>Informative</td>
<td>ATMs</td>
<td></td>
<td>Statements</td>
<td></td>
<td>Entertainment industry</td>
</tr>
<tr>
<td>Cinema</td>
<td>Enjoyable</td>
<td>Films</td>
<td>Film projection</td>
<td>Entertainment Snacks</td>
<td>Film popularity</td>
<td>Economy</td>
</tr>
<tr>
<td></td>
<td>Variety</td>
<td>Food</td>
<td>Food preparation</td>
<td></td>
<td>Disposable incomes</td>
<td>Entertainment industry</td>
</tr>
<tr>
<td></td>
<td>Timely</td>
<td>People</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Reliable</td>
<td>Materials</td>
<td>Cutting</td>
<td>Machines</td>
<td>Material flows</td>
<td>Economy</td>
</tr>
<tr>
<td></td>
<td>Affordable</td>
<td>Equipment</td>
<td>Forming</td>
<td>Chemicals</td>
<td>Production volumes</td>
<td>Commodity prices</td>
</tr>
<tr>
<td></td>
<td>Quality</td>
<td>Labor</td>
<td>Joining</td>
<td>Consumer goods</td>
<td></td>
<td>Consumer market</td>
</tr>
<tr>
<td></td>
<td>Variety</td>
<td>Technology</td>
<td>Mixing</td>
<td>Scrap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>Knowledge</td>
<td>Books</td>
<td>Learning</td>
<td>Educated students</td>
<td>Demographics</td>
<td>State and county boards</td>
</tr>
<tr>
<td></td>
<td>Safe</td>
<td>Teachers</td>
<td>Counseling</td>
<td>Skills</td>
<td>Grievances</td>
<td>Tax system</td>
</tr>
<tr>
<td></td>
<td>Trustworthy</td>
<td>Facility</td>
<td>Motivating</td>
<td>Research</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Friendly</td>
<td>Students</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

operations into a series of subject areas as shown in Table 1.3. These areas are quite interdependent, but to make their workings more understandable we discuss them as though they were easily separable from each other. In some areas, a full-fledged department may be responsible for the activities, such as quality control or scheduling, but in other areas the activities (such as facility location) may be infrequent and simply assigned to a particular group or project team. Moreover, some of the sub-areas such as supply chain management or maintenance are critically important because they are a part of a larger business process or because other areas depend on them. Finally, since we consider all operations to be services, these subject areas are equally applicable to organizations that have traditionally been classified as manufacturers and services.

CUSTOMER VALUE

In the Introduction to this chapter we mentioned that customers support the provider of goods and services who offers them the most “value.” In this section we elaborate on this concept. The equation for value is conceptually clear:

\[ \text{Value} = \text{perceived benefits}/\text{costs} \]
The perceived benefits can take a wide variety of forms, but the costs are usually more straightforward:

- the upfront monetary investment;
- other monetary lifecycle costs for maintenance and such; and
- the hassles involved in obtaining the product or service such as travel distance, financing for the upfront investment, friendliness of service, and so on.

In contrast, the benefits can be multiple. We will consider five of these in detail: innovativeness, functionality, quality, customization, and responsiveness.

**Innovativeness**

Many people (called “early adopters” in marketing) will buy products and services simply because they are so innovative, or major improvements over what has been available formerly. It is the field of Research and Development (known as R&D) that
is primarily responsible for developing innovative new product and service ideas. R&D activities focus on creating and developing (but not producing) the organization’s outputs. On occasion, R&D also creates new production methods by which outputs, either new or old, may be produced.

Research itself is typically divided into two types: pure and applied. Pure research is simply working with basic technology to develop new knowledge. Applied research is attempting to develop new knowledge along particular lines. For example, pure research might focus on developing a material that conducts electricity with zero resistance, whereas applied research could focus on further developing this material to be used in products for customers. Development is the attempt to utilize the findings of research and expand the possible applications, often consisting of modifications or extensions to existing outputs to meet customers’ interests. Figure 1.3 illustrates the range of applicability of development as the output becomes more clearly defined. In the early years of a new output, development is oriented toward removing “bugs,” increasing performance, improving quality, and so on. In the middle years, options and variants of the output are developed. In the later years, development is oriented toward extensions of the output that will prolong its life.

Unfortunately, the returns from R&D are frequently meager, whereas the costs are great. Figure 1.4 illustrates the mortality curve (fallout rate) associated with the concurrent design, evaluation, and selection for a hypothetical group of 50 potential chemical products, assuming that the 50 candidate products are available for consideration in year 3. (The first three years, on the average, are required for the necessary research preceding each candidate product.) Initial evaluation and screening reduce the 50 to about 22, and economic analysis further reduces the number to about 9. Development reduces this number even more, to about 5, and design and testing reduce it to perhaps 3. By the time construction (for production), market development, and a year’s commercialization are completed, there is only one
successful product left. (Sometimes there are none!) One study found that, beyond this, only 64 percent of the new products brought to market were successful, or about two out of three.

Two alternatives to research frequently used by organizations are imitation of a proven new idea (i.e., employing a second-to-market strategy) or outright purchase of someone else’s invention. The outright purchase strategy is becoming extremely popular in those industries where bringing a new product to market can cost huge sums, such as pharmaceuticals and high technology. It is also employed in those industries where technology advances so rapidly that there isn’t enough time to employ a second-to-market strategy. Although imitation does not put the organization first in the market with the new product or service, it does give an opportunity to study any possible defects in the original product or service and rapidly develop a better design, frequently at a better price. The second approach—purchasing an invention or the inventing company itself—eliminates the risks inherent in research, but it still requires the company to develop and market the product or service before knowing whether it will be successful. Either route spares the organization the risk and tremendous cost of conducting the actual research leading up to a new invention or improvement.

In addition to product research (as it is generally known), there is also process research, which involves the generation of new knowledge concerning how to produce outputs. Currently, the production of many familiar products out of plastic (toys, pipe, furniture, etc.) is an outstanding example of successful process research. Motorola, to take another example, extensively uses project teams that conduct process development at the same time as product development.
Chapter 1: Operations Strategy and Global Competitiveness

Functionality

Many people confuse functionality with quality (discussed next). But functionality involves the activities the product or service is intended to perform, thereby providing the benefits to the customer. A contemporary example is the ubiquitous “cell phone.” These days it is probably rare to find a cell phone which is only a phone; many phones include a camera and a way to send its picture to another person, or provide access to the internet, as well as a myriad of other functions.

However, many products, especially electronics, but also some services, may be advertised to provide purchasers with a new, unique function and they may do so, but it may not work well, or for long. The former involves performance and the latter has to do with reliability. Clearly, these are different attributes of the output, and one can be well addressed while other attributes disappoint. Our discussion of quality, next, elaborates a bit more on the distinction between these attributes.

Quality

Quality is a relative term, meaning different things to different people at different times. Moreover, quality is not an absolute but, rather, is based on customers’ perceptions. Customers’ impressions can be influenced by a number of factors, including brand loyalty and an organization’s reputation.

Quality dimensions

Richard J. Schonberger has compiled a list of multiple quality dimensions that customers often associate with products and services:

1. **Conformance to specifications.** Conformance to specifications is the extent to which the actual product matches the design specifications, such as a pizza delivery shop that consistently meets its advertised delivery time of 30 minutes.

2. **Performance.** Customers frequently equate the quality of products and services with their performance. (Note, however, that this dimension may in some cases actually refer to functionality.) Examples of performance include how quickly a sports car accelerates or the battery life of a cell phone.

3. **Features.** Features are the options that a product or service offers, such as side impact airbags in automobiles and leather seats. (Again, however, this dimension may also be confused with functionality.)

4. **Quick response.** Quick response is associated with the amount of time required to react to customers’ demands. However, we consider this to be a separate benefit, discussed further below.

5. **Reliability.** Reliability is the probability that a product or service will perform as intended on any given trial or for some period of time, such as the probability that a car will start on any given morning.

6. **Durability.** Durability refers to how tough a product is, such as a notebook computer that still functions after being dropped, or a knife that can cut through steel and not need sharpening.
7. **Serviceability.** Serviceability refers to the ease with which maintenance or a repair can be performed.

8. **Aesthetics.** Aesthetics are factors that appeal to human senses, such as the taste of a steak or the sound of a sports car’s engine.

9. **Humanity.** Humanity has to do with how the customer is treated, such as a private university that maintains small classes so students are not treated like numbers by its professors.

It is worth noting that not all the dimensions of quality are relevant to all products and services. Thus, organizations need to identify the dimensions of quality that are relevant to the products and services they offer. Market research about customers’ needs is the primary input for determining which dimensions are important. Of course, measuring the quality of a service can often be more difficult than measuring the quality of a product or facilitating good. However, the dimensions of quality described above apply to both.

**Quality’s benefits and costs**

Many benefits are associated with providing products and services that have high quality. Obviously, customers are more pleased with a high-quality product or service. They are more apt to encourage their friends to patronize the firm, as well as giving the firm their own repeat business. Top quality also establishes a reputation for the firm that is very difficult to obtain in any other manner, and it allows the firm to charge a premium price. And typically, high-quality products and services are not only the most profitable but also garner the largest market shares. High quality also tends to protect the firm from competitors, who may have to offer competing outputs at an especially low price (and low margins). It also enhances the attractiveness of follow-up products or services so that their chances of success are much improved. And, of course, high quality minimizes risks to safety and health and reduces liability for the firm.

Traditionally, it was thought that making products and services of excellent quality would translate into higher costs. Of course this view neglects the negative consequences of gaining a reputation for producing shoddy outputs. Also, the Japanese have demonstrated that it is often possible to improve quality and lower costs at the same time. One explanation for this phenomenon is that it is simply cheaper to do a job right the first time than to try to fix it or rework it later. And if quality is built into the production system, it improves workers’ morale, reduces scrap and waste, smoothes work flows, improves control, and reduces a wide variety of other costs. As a result, Philip Crosby, a well-known quality consultant, maintains that “quality is free,” as in the title of his book, *Quality Is Free* (1979), which sold approximately 1 million copies. Crosby estimates that firms can lose up to 25 percent of the amount of their sales because of poor quality.

Two primary sets of costs are involved in quality: control costs and failure costs. The aggregate of these costs runs between 15 and 35 percent of sales for many U.S. firms. Traditionally, these costs are broken down into four categories: prevention costs (including planning, training, product design, maintenance); appraisal costs (measuring, testing, test equipment, inspectors, reports); internal costs of defects (extra labor and materials to repair, scrap, rework interruptions, expediting); and external costs of defects (ill-will, complaints, quick response to correct, warranties, insurance, recalls, lawsuits). The first two costs are incurred in attempting to control quality, and the last two are the costs of failing to control quality. Costs of defects (or nonconformance) can run from 50 to 90 percent of the total cost of quality.
Evolution of quality: Japan vs. America

Although you might think that “made in Japan” signifies a product of superior quality, it may surprise you to learn that many of the techniques and philosophies Japanese companies employ today were actually developed in the United States, often around the end of World War II. Unfortunately, the sentiment among U.S. manufacturers at the end of World War II was that they already produced the highest-quality products in the world at the lowest cost. Thus, they were not particularly interested in or concerned with improving quality.

Japan was an entirely different story. Its products had a reputation for poor quality, and after it lost the war its economy was a shambles. As a result, Japanese manufacturers were eager for help related to quality improvement. In 1950 the Japanese government invited W. Edwards Deming (then a professor at New York University) to give a series of lectures on quality control to help Japanese engineers reindustrialize the country. But Deming insisted that the heads of the companies attend the talks too. As a result, the top Japanese managers were also invited, and they all showed up.

According to Deming (1986), the major cause of poor quality is variation. Thus, a key tenet of Deming’s approach is to reduce variability in the process. (This topic is discussed further in Chapter 4: Process Improvement—Reducing Variation through Six Sigma.) Deming stressed that improving quality was the responsibility of top management. However, he also believed that all employees should be trained in the use of problem-solving tools and especially statistical techniques. Deming believed that improvements in quality created a chain reaction where improved quality leads to lower costs, which then translate into higher productivity. In contrast to Deming, Crosby focused more on management, organizational processes, and changing corporate culture than on the use of statistical techniques.

Deming promised the Japanese that if they followed his advice, they would be able to compete with the West within just a few years. They did! Now the most prestigious industrial quality award given in Japan each year is named the Deming Prize. But the Japanese did not stop there. They tied the concept of quality control directly into their production system—and now they have even tied it into their entire economy through inspections to guarantee the quality of exports. The natural inclinations of Japanese culture and traditions were exploited in this quality crusade. After nearly two decades of a national emphasis on quality, Japan’s reputation for producing shoddy goods was totally reversed. And, when high quality is combined with competitive pricing—another strength of the Japanese system—the result is extremely strong competition for existing producers.

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Customer Value

A more recent concept (similar to zero defects) that the Japanese and some American firms have embraced is called *total quality management* (TQM) or *total quality control* (TQC). The basic idea of TQM is that it is extremely expensive to “inspect” quality into a company’s outputs and much more efficient and effective to produce them right in the first place. As a result, responsibility for quality has been taken away from the quality control department and placed where it belongs—with the workers who produce the parts or provide the service in the first place. This is called *quality at the source*. It is the heart of *statistical quality control* (SQC), sometimes called *statistical process control* (SPC), which we discuss further in Chapter 3.

Customization

*Customization* refers to offering a product or service exactly suited to a customer’s desires or needs. However, there is a range of accommodation to the customer’s needs, as illustrated in Figure 1.5. At the left, there is the completely standard, world-class (excellence suitable for all markets) product or service. Moving to the right is the standard with options, continuing on to variants and alternative models, and ending at the right with made-to-order customization. In general, the more customization the better, if it can be provided quickly, with acceptable quality and cost.

![Figure 1.5 Continuum of customization.](image)

Flexibility

However, to offer customization demands flexibility on the part of the firm. Professor David Upton (1994, p. 73), formerly of the Harvard Business School, defines flexibility as “the ability to change or react with little penalty in time, effort, cost, or performance.” There are more than a dozen different types of flexibility that we will not pursue here—design, volume, routing through the production system, product mix, and many others. But having the right types of flexibility can offer the following major competitive advantages:

- Faster matches to customers’ needs because changeover time from one product or service to another is quicker.
- Closer matches to customers’ needs.
Chapter 1: Operations Strategy and Global Competitiveness

- Ability to supply the needed items in the volumes required for the markets as they develop.
- Faster design-to-market time to meet new customer needs.
- Lower cost of changing production to meet needs.
- Ability to offer a full line of products or services without the attendant cost of stocking large inventories.
- Ability to meet market demands even if delays develop in the production or distribution process.

Mass Customization

Until recently, it was widely believed that producing low-cost standard products (at the far left in Figure 1.5) required one type of transformation process and producing higher-cost customized products (far right) required another type of process. However, in addition to vast improvements in operating efficiency, an unexpected byproduct of the continuous improvement programs of the 1980s was substantial improvement in flexibility. Indeed, prior to this, efficiency and flexibility were thought to be tradeoffs. Increasing efficiency meant that flexibility had to be sacrificed, and vice versa.

Thus, with the emphasis on continuous improvement came the realization that increasing operating efficiency could also enhance flexibility. For example, many manufacturers initiated efforts to reduce the amount of time required to set up (or change over) equipment from the production of one product to another. Obviously, all time spent setting up equipment is wasteful, since the equipment is not being used during this time to produce outputs that ultimately create revenues for the organization. Consequently, improving the amount of time a resource is used productively directly translates into improved efficiency. Interestingly, these same reductions in equipment setup times also resulted in improved flexibility. Specifically, with shorter equipment setup times, manufacturers could produce economically in smaller-size batches, making it easier to switch from the production of one product to another.

In response to the discovery that efficiency and flexibility can be improved simultaneously and may not have to be traded off, the strategy of mass customization emerged (see Pine 1993 and Gilmore and Pine 1997). Organizations pursuing mass customization seek to produce low-cost, high-quality outputs in high variety. Of course, not all products and services lend themselves to being customized. This is particularly true of commodities such as sugar, gas, electricity, and flour. On the other hand, mass customization is often quite applicable to products characterized by short life cycles, rapidly advancing technology, or changing customer requirements. However, recent research suggests that successfully employing mass customization requires an organization to first develop a transformation process that can consistently deliver high-quality outputs at a low cost. With this foundation in place, the organization can then seek ways to increase the variety of its offerings while at the same time ensuring that quality and cost are not compromised.

In an article published in *Harvard Business Review*, Gilmore and Pine (1997) identified four mass customization strategies:

1. **Collaborative customizers.** These organizations establish a dialogue to help customers articulate their needs and then develop customized outputs to meet these needs. For example, one Japanese eyewear retailer developed
a computerized system to help customers select eyewear. The system combines a digital image of the customer's face and then various styles of eyewear are displayed on the digital image. Once the customer is satisfied, the customized glasses are produced at the retail store within an hour.

2. **Adaptive customizers.** These organizations offer a standard product that customers can modify themselves, such as fast-food hamburgers (ketchup, etc.) and closet organizers. Each closet-organizer package is the same, but includes instructions and tools to cut the shelving and clothes rods so that the unit can fit a wide variety of closet sizes.

3. **Cosmetic customizers.** These organizations produce a standard product but present it differently to different customers. For example, Planters packages its peanuts and mixed nuts in a variety of containers on the basis of specific needs of its retailing customers such as Wal-Mart, 7-Eleven, and Safeway.

4. **Transparent customizers.** These organizations provide custom products without the customers knowing that a product has been customized for them. For example, Amazon.com provides book recommendations based on information about past purchases.

**Example: Hewlett-Packard**

Faced with increasing pressure from its customers for quicker order fulfillment and for more highly customized products, Hewlett-Packard (HP) wondered whether it was really possible to deliver mass-customized products rapidly, while at the same time continuing to reduce costs (Feitzinger and Lee 1997). HP’s approach to mass customization can be summarized as effectively delaying tasks that customize a product as long as possible in the product supply process. It is based on the following three principles:

- Products should be designed around a number of independent modules that can be easily combined in a variety of ways.
- Manufacturing tasks should also be designed and performed as independent modules that can be relocated or rearranged to support new production requirements.
- The product supply process must perform two functions. First, it must cost-effectively supply the basic product to the locations that complete the customization activities. Second, it must have the requisite flexibility to process individual customers’ orders.

HP has discovered that modular design provides three primary benefits. First, components that differentiate the product can be added during the later stages of production. This method of mass customization is generally called *postponement*, and is one form of the assemble-to-order production process, discussed in more detail in Chapter 3. For example, the company designed its printers so that country-specific power supplies are combined with the printers at local distribution centers and actually plugged in by the customer when the printer is set up. Second, production time can be significantly reduced by simultaneously producing the required modules. Third, producing in modules facilitates the identification of production and quality problems.
Responsiveness

The competitive advantages of faster, dependable response to new markets or to the individual customer’s needs have occasionally been noted in the business media (Vessey 1991, Eisenhardt and Brown 1998, and Stalk 1988). For example, in a study of the U.S. and Japanese robotics industry, the National Science Foundation found that the Japanese tend to be about 25 percent faster than Americans, and to spend 10 percent less, in developing and marketing new robots. The major difference is that the Americans spend more time and money on marketing, whereas the Japanese spend five times more than the Americans on developing more efficient production methods.

Table 1.4 identifies a number of prerequisites for and advantages of fast, dependable response. These include higher quality, faster revenue generation, and lower costs through elimination of overhead, reduction of inventories, greater efficiency, and fewer errors and scrap. One of the most important but least recognized advantages for managers is that by responding faster, they can allow a customer to delay an order until the exact need is known. Thus, the customer does not have to change the order—a perennial headache for most operations managers.

<table>
<thead>
<tr>
<th>#</th>
<th>Prerequisites for and Advantages of Rapid Response</th>
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<tbody>
<tr>
<td>1</td>
<td>Sharper focus on the customer: Faster response for both standard and custom-designed items places the customer at the center of attention.</td>
</tr>
<tr>
<td>2</td>
<td>Better management: Attention shifts to management’s real job, improving the firm’s infrastructure and systems.</td>
</tr>
<tr>
<td>3</td>
<td>Efficient processing: Efficient processing reduces inventories, eliminates non-value-added processing steps, smoothes flows, and eliminates bottlenecks.</td>
</tr>
<tr>
<td>4</td>
<td>Higher quality: Since there is no time for rework, the production system must be sufficiently improved to make parts accurately, reliably, consistently, and correctly.</td>
</tr>
<tr>
<td>5</td>
<td>Elimination of overhead: More efficient, faster flows through fewer steps eliminate the overhead needed to support the remaining steps, processes, and systems.</td>
</tr>
<tr>
<td>6</td>
<td>Improved focus: A customer-based focus is provided for strategy, investment, and general attention (instead of an internal focus on surrogate measures such as utilization).</td>
</tr>
<tr>
<td>7</td>
<td>Reduced changes: With less time to delivery, there is less time for changes in product mix, engineering changes, and especially changes to the order by the customer who just wanted to get in the queue in the first place.</td>
</tr>
<tr>
<td>8</td>
<td>Faster revenue generation: With faster deliveries, orders can be billed faster, thereby improving cash flows and reducing the need for working capital.</td>
</tr>
<tr>
<td>9</td>
<td>Better communication: More direct communication lines result in fewer mistakes, oversights, and lost orders.</td>
</tr>
<tr>
<td>10</td>
<td>Improved morale: The reduced processing steps and overhead allow workers to see the results of their efforts, giving a feeling of working for a smaller firm, with its greater visibility and responsibility.</td>
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Faster response to a customer also can, up to a point, reduce the unit costs of the product or service, sometimes significantly. On the basis of empirical studies reported by Meredith et al. (1994) and illustrated in Figure 1.6, it seems that there is about a 2:1 (i.e., 0.50) relationship between response time and unit cost. That is, starting from typical values, an 80 percent reduction in response time results in a corresponding
Strategy and Competitiveness

40 percent reduction in unit cost. The actual empirical data indicated a range between about 0.60 and 0.20, so for an 80 percent reduction in response time there could be a cost reduction from a high of \(0.60 \times 80\% = 48\%\) to a low of 16 percent.

This is an overwhelming benefit because if corresponding price reductions are made, it improves the value delivered to the customer through both higher responsiveness and lower price. The result for the producer is a much higher market share. If the producer chooses not to reduce the price, then the result is both higher margins and higher sales, for significantly increased profitability.

STRATEGY AND COMPETITIVENESS

Competitiveness can be defined in a number of ways. We may think of it as the long-term viability of a firm or organization; or we may define it in a short-term context such as the current success of a firm in the marketplace as measured by its market share or its profitability. We can also talk about the competitiveness of a nation, in the sense of its aggregate competitive success in all markets. The U.S. President’s Council on Industrial Competitiveness gave this definition in 1985:

Competitiveness for a nation is the degree to which it can, under free and fair market conditions, produce goods and services that meet the test of international markets while simultaneously maintaining and expanding the real incomes of its citizens.

Global Trends

The United States provides a graphic example of global trade trends. The trend in merchandise trade for the United States is startling. Although some might think that
foreign competition has been taking markets away from U.S. producers only in the past decade, U.S. merchandise imports have grown considerably for over 30 years. Although exports have increased over this period as well, they have not increased as fast as imports; the result is an exploding trade deficit with foreign countries. Partly as a result of this deficit, the United States is now the biggest debtor nation in the world, with a cumulative deficit of about 5 trillion dollars, nearly half of the U.S. annual gross domestic product (GDP), and an annual deficit running about 6 percent of GDP. However, these values hold only for the period up to mid-2008, when the global financial/credit/recession crisis started. It now appears that all these figures will become much worse, and not for just the U.S. but globally.

Another important issue relating to the financial crisis involves the exchange rate between currencies. Let’s consider in more detail what it means when a country’s currency declines in value relative to foreign currencies. A weaker currency means that citizens in that country will have to pay more for products imported from foreign countries. Meanwhile, the prices for products produced in that country and exported to foreign countries will decline, making them more desirable. Thus, a decline in the value of a country’s currency is a double-edged sword. Such a decline makes imported goods more expensive for citizens to purchase but at the same time makes exports less expensive for foreign consumers, increasing the demand for domestic products.

As an example, let’s consider the American dollar. In the financial crisis of 2008, the dollar grew stronger as Americans sold foreign assets and foreigners rushed to hold assets in the dollar, the world’s strongest currency, as well as a “reserve” (commodities are priced in dollars) currency. However, given the massive amount of dollars the U.S. government borrowed and created to overcome the financial crisis, there is widespread concern that the dollar may weaken or even collapse in the future.

According to economic theory, a stronger dollar should make American products less desirable (or competitive) in foreign markets, and imports more desirable in American markets. However, some market actions that governments and businesses often take to keep from losing customers can alter this perfect economic relationship. For instance, in the 1990s, when the price of Japanese products in the United States started increasing in terms of dollars, Japanese firms initiated huge cost-cutting drives to reduce the cost (and thereby the dollar price) of their products, to keep from losing American customers, which was largely successful. Similarly, China controls the exchange rate of its currency, the renminbi, to stay at about 7 to the dollar (though they have been letting it strengthen recently) so it always sells its goods at a competitive price.

In the last decade, particularly with the economic rise of China and India, global markets, manufacturers, and service producers have evolved in a dramatic fashion. With the changes occurring in the World Trade Organization (WTO), international competition has grown very complex in the last two decades. Previously, firms were domestic, exporters, or international. A domestic firm produced and sold in the same country. An exporter sold goods, often someone else’s, abroad. An international firm sold domestically produced as well as foreign-produced goods both domestically and in foreign countries. However, domestic sales were usually produced domestically, and foreign sales were made either in the home country or in a plant in the foreign country, typically altered to suit national regulations, needs, and tastes.

Now, however, there are global firms, joint ventures, partial ownerships, foreign subsidiaries, and other types of international producers. For example, Canon is a
global producer that sells a standard “world-class” camera with options and add-ons available through the local dealer. And automobile producers frequently own stock in foreign automobile companies. Mazak, a fast-growing machine tool company, is the U.S. subsidiary of Yamazaki Machinery Company of Japan. Part of the reason for cross-ownerships and cross-endeavors is the spiraling cost of bringing out new products. New drugs and memory chips run in the hundreds of millions to billions of dollars to bring to market. By using joint ventures and other such approaches to share costs (and thereby lower risks), firms can remain competitive.

Whether to build offshore, assemble offshore, use foreign parts, employ a joint venture, and so on is a complex decision for any firm and depends on a multitude of factors. For example, the Japanese have many of their automobile manufacturing plants in foreign countries. The reasons are many and include: to circumvent foreign governmental regulation of importers, to avoid the high yen cost of Japanese-produced products, to avoid import fees and quotas, and to placate foreign consumers. Of course, other considerations are involved in producing in foreign countries: culture (e.g., if women are part of the labor force), political stability, laws, taxes, regulations, and image.

Other complex arrangements of suppliers can result in hidden international competition. For example, many products that bear an American nameplate have been totally produced and assembled in a foreign country and are simply imported under a U.S. manufacturer’s or retailer’s nameplate, such as Nike shoes. Even more confusing, many products contain a significant proportion of foreign parts, or may be composed entirely of foreign parts and only assembled in the United States (e.g., toasters, mixers, hand tools). This recent strategic approach of finding the best mix of producers and assemblers to deliver a product or service to a customer has come to be known as “supply chain management,” a topic we discuss in detail in Chapter 7.

**Strategy**

The organization’s business strategy is a set of objectives, plans, and policies for the organization to compete successfully in its markets. In effect, the business strategy specifies what an organization’s competitive advantage will be and how this advantage will be achieved and sustained. As we will see, a key aspect of the business strategy is defining the organization’s core competencies and focus. The actual strategic plan that details the business strategy is typically formulated at the executive committee level (CEO, president, vice presidents). It is usually long range, in the neighborhood of three to five years.

In fact, however, the decisions that are made over time are the long-range strategy. In too many firms, these decisions show no pattern at all, reflecting the truth that they have no active business strategy, even if they have gone through a process of strategic planning. In other cases these decisions bear little or no relationship to the organization’s stated or official business strategy. The point is that an organization’s actions often tell more about its true business strategy than its public statements.

The general process of formulating a business strategy is illustrated in Figure 1.7. Relevant inputs to the strategic planning process include the organization’s vision/mission statement, a variety of factors external to the organization, and a range of factors internal to the organization. One school of thought—the Resource Based View—considers the set of resources (an internal factor in Figure 1.7) available to
the organization as the primary driver of the business strategy. For further discussion of this topic and its impact on the development of corporate strategy, consult Barney and Clark (2007) or Collis and Montgomery (2005).

After collectively considering these inputs, strategic planning is often initiated by developing a vision statement, a mission statement, or both. Vision statements are used to express the organization’s values and aspirations. Mission statements express the organization’s purpose or reason for existence. In some cases, organizations may choose to combine the vision and mission statements into a single statement. Regardless of whether separate statements or combined statements are developed, the intent is to communicate the organization’s values, aspirations, and purpose so that employees can make decisions that are consistent with and support these objectives.

Effective vision and mission statements tend to be written using language that inspires employees to high levels of performance. Further, to foster employees’ commitment, it is advisable to include a wide variety of employees in the development of the vision or mission statement, rather than enforcing top management’s view by edict. Once the vision and mission statements are developed for the organization as a whole, divisions, departments, process teams, project teams, work groups, and so on can develop individual vision-mission statements that support the organization’s overall statement. For example, after a university develops its overall vision-mission statement, each college could develop its own unique statements specifying the role that it will play in supporting the overall mission of the university. Likewise, once each school develops its own vision-mission statement, the departments within the school can develop unique statements. Having each organizational unit develop its own unique statements promotes wider participation in the process, helps employees think in terms of how their work supports the overall mission, and results

![Figure 1.7 Strategy formulation.](image-url)
THE CENTRAL INTELLIGENCE AGENCY

**Vision**

One Agency. One Community. An Agency unmatched in its core capabilities, functioning as one team, fully integrated into the Intelligence Community.

**Mission**

We are the nation’s first line of defense. We accomplish what others cannot accomplish and go where others cannot go. We carry out our mission by:

- Collecting information that reveals the plans, intentions, and capabilities of our adversaries and provides the basis for decision and action.
- Producing timely analysis that provided insight, warning, and opportunity to the President and decision makers charged with protecting and advancing America’s interests.
- Conducting covert action at the direction of the President to preempt threats or achieve U.S. policy objectives.

Figure 1.8 An example of a vision and mission statement.

in statements that are more meaningful to a select group of employees. An example of an actual vision and mission statement are given in Figure 1.8.

In addition to the vision/mission statement, other important inputs in the formulation of the business strategy are categorized as forces external and forces internal to the organization in Figure 1.7. Although both sets of forces are considered to some extent in formulating the vision/mission statement (as shown by the dotted lines in the figure), they are considered at a more detailed level and more directly when developing the business strategy. Important external forces include the environment (e.g., the economy, government regulations, climate), competitors (e.g., new product introductions, industry consolidation, new entrants from outside the industry), the technology available, and customer requirements. Relevant internal forces include organizational resources, the organization’s core competencies/capabilities, its culture, and its weaknesses. As shown, there is a bidirectional relationship between the organization’s business strategy and both the internal and external forces. For example, an action by a key competitor may impact the organization’s strategy just as its business strategy may force a reaction by a key competitor.

Overall, as seen in Figure 1.7, strategy is primarily concerned with making sets of choices that result in a “business model” which provides the tools to help further develop and communicate the strategy. In particular, the business model can help an organization verify that the elements of the strategy are consistent with one another, that they are logical, and that they are mutually reinforcing. Business models typically including expanded verbal discussions of key elements of the strategy as well as quantitative projections for important operational, marketing, and financial aspects of the business.
To help further understand the distinction between strategy and a business model, consider the construction of a custom home. Initially, the architect consults with the future homeowners to understand how they envision the home and their life within it. The architect then creates a design to fulfill this vision. This corresponds to strategy. Next, the architect prepares a detailed floor plan and elevation based on the choices made during the design process. These correspond to the business model. Just as a business model can be used to help analyze and communicate strategic choices, the floor plan can be used to help understand, analyze, and communicate the design choices that were made.

Once the business strategy has been developed and the resulting business model analyzed, the final step in strategy formulation is the development of business unit strategies. At this stage, each business unit develops its own strategy to guide its activities so that they are consistent and support the organization’s overall business strategy. Although formulating the business strategy is displayed as rather straightforward in Figure 1.7, in reality it is very iterative.

### Strategic Frameworks

We now move to a discussion of the Business Unit Strategies box in Figure 1.7. Clearly, there will be a Marketing Strategy, a Financial Strategy, an R&D Strategy, and so on. Here, of course, we are interested in the Operations Strategy. As it happens, there are a number of fairly well defined such strategies. One that is common to many of the functional areas is related to the life cycle of the organization’s products or services.

### The Life Cycle

A number of functional strategies are tied to the stages in the standard life cycle of products and services, shown in Figure 1.9. Studies of the introduction of new products indicate that the life cycle (or stretched-S growth curve, as it is also known)
provides a good pattern for the growth of demand for a new output. The curve can be divided into three major segments: (1) introduction and early adoption, (2) acceptance and growth of the market, and (3) maturity with market saturation. After market saturation, demand may remain high or decline; or the output may be improved and possibly start on a new growth curve.

The length of product and service life cycles has been shrinking significantly in the last decade or so. In the past, a life cycle might have been five years, but it is now six months. This places a tremendous burden on the firm to constantly monitor its strategy and quickly change a strategy that becomes inappropriate to the market.

The life cycle begins with an innovation—a new output or process for the market, as discussed earlier. The innovation may be a patented product or process, a new combination of existing elements that has created a unique product or process, or some service that was previously unavailable. Initial versions of the product or service may change relatively frequently; production volumes are small, since the output has not caught on yet; and margins are high. As volume increases, the design of the output stabilizes and more competitors enter the market, frequently with more capital-intensive equipment. In the mature phase, the now high-volume output is a virtual commodity, and the firm that can produce an acceptable version at the lowest cost usually controls the market.

Clearly, a firm’s business strategy should match the life-cycle stages of its products and services. If a firm such as Hewlett-Packard is good at innovation, it may choose to focus only on the introduction and acceptance phases of the product’s life cycle and then sell or license production to others as the product moves beyond the introduction stage. If its strength is in high-volume, low-cost production, the company should stick with proven products that are in the maturity stage. Most common, perhaps, are firms that attempt to stick with products throughout their life cycle, changing their strategy with each stage.

One approach to categorizing an organization’s business strategy is based on its timing of introductions of new outputs. Two researchers, Maidique and Patch (1979), suggest the following four product development strategies:

1. **First-to-market.** Organizations that use this strategy attempt to have their products available before the competition. To achieve this, strong applied research is needed. If a company is first to market, it has to decide if it wants to price its products high and thus skim the market to achieve large short-term profits or set a lower initial price to obtain a higher market share and perhaps larger long-term profits.

2. **Second-to-market.** Organizations that use this strategy try to quickly imitate successful outputs offered by first-to-market organizations. This strategy requires less emphasis on applied research and more emphasis on fast development. Often, firms that use the second-to-market strategy attempt to learn from the mistakes of the first-to-market firm and offer improved or enhanced versions of the original products.

3. **Cost minimization or late-to-market.** Organizations that use this strategy wait until a product becomes fairly standardized and is demanded in large volumes. They then attempt to compete on the basis of costs as opposed to
features of the product. These organizations focus most of their research and development on improving the production system, as opposed to focusing on product development.

4. **Market segmentation.** This strategy focuses on serving niche markets with specific needs. Applied engineering skills and flexible manufacturing systems are often needed for the market-segmentation strategy.

Be aware that a number of implicit tradeoffs are involved in developing a strategy. Let us use the first-to-market strategy to demonstrate. A first-to-market strategy requires large investments in product development in an effort to stay ahead of the competition. Typically, organizations that pursue this strategy expect to achieve relatively higher profit margins, larger market shares, or both as a result of initially having the market to themselves. The strategy is somewhat risky because a competitor may end up beating them to the market. Also, even if a company succeeds in getting to the market first, it may end up simply creating an opportunity for the competition to learn from its mistakes and overtake it in the market. To illustrate, although Sony introduced its Betamax format for VCRs in 1975, JVC’s VHS format—introduced the following year—is the standard that ultimately gained widespread market acceptance.

Such tradeoffs are basic to the concept of selecting a business strategy. Although specific tasks must be done well to execute the selected strategy, not everything needs to be particularly outstanding—only a few things. And of course, strategies based on anything else—acquisitions, mergers, tax loss carry-forwards, even streams of high-technology products—will not be successful if the customer is ignored in the process.

**Performance Frontiers**

As we know from the earlier Customer Value section, there is a wide range of benefits and costs that organizations can compete on and various groups of customers value. If, say, \( n \) of these factors are important for an organization to consider, we might then conceive of a graph or space with \( n \) dimensions on it showing the organization’s measures on each of the \( n \) factors as well as their competitor’s measures. The curve connecting all these measures would then be called the organization’s **performance frontier** (Clark 1996). For simplicity, let us use just two factors, say cost and variety, as shown in Figure 1.10 with the performance frontier curve labeled 1.

![Performance Frontier](image-url)
As illustrated by the points A, B, and C, improving on one dimension can usually only be attained by sacrificing performance on another dimension. For example, as shown in Figure 1.10, increasing output variety may result in higher unit costs. In effect, this curve represents the level of performance that organizations in an industry can achieve across two dimensions given the technology available. According to the figure, company A is apparently pursuing more of a variety strategy than the two other competitors shown, offering a wider variety of outputs but incurring greater cost. We might think of J.C. Penney as perhaps fitting point A. Company C, perhaps K-Mart, seems to be pursuing a standardization strategy, offering a smaller range of outputs but incurring lower unit costs.

An interesting use of this framework is to investigate and evaluate the impact of a change in technology or operational innovation (Hammer 2004). For example, in Figure 1.11, assume a new innovation such as “cross-docking” has been developed by company B, perhaps represented by Wal-Mart, shifting its performance frontier to curve 2. In this case, company B could hold its unit price constant and offer higher output variety than company A and at lower unit cost (position B1). Alternatively, company B could maintain its current level of output variety and lower its unit cost to levels below company C’s (position B2), or perhaps choose a position somewhere between points B1 and B2.

Figure 1.11 Development of new technology results in shift in the performance frontier.

Suppose you were employed at company A and company B chose to operate at point B1. In effect, company B can now offer a wider variety of outputs and at lower unit costs. What are your options? As it turns out, there are two generic options or improvement trajectories company A could try to follow. One improvement trajectory would be for company A to streamline its operations and make cost-variety tradeoffs, moving down curve 1 toward company C. Upon streamlining its operations, company A could then attempt to adopt the new technology and choose a position on the new frontier. A second improvement trajectory would be for company A to attempt to directly adopt the new technology and move to the new frontier without streamlining its current operations.

There are advantages and disadvantages associated with both trajectories. An advantage of streamlining operations first is that this may provide a better understanding of current processes. In turn, this better understanding may increase com-
pany A’s options in choosing a location on the new frontier and may even better position it to adopt the new technology. One drawback of streamlining its current operations first is that the knowledge gained may be irrelevant when the new technology is eventually adopted, and delaying the adoption of the new technology may mean reduced market share and profits. Another important factor is the amount of time required to execute the improvement trajectory and get to the new position on the new performance frontier. However, although it might appear that streamlining the current operation first before adopting the new technology should take more time than immediately adopting the technology, when ease of implementation is considered, the former approach may in fact be more expedient.

On a more practical note, KMart some years ago tried to challenge Wal-Mart on low prices but was unsuccessful. Then Sears and KMart merged instead; but at this time, that didn’t seem to work well either and now both seem to be in trouble.

One final point. In Figure 1.11 it was assumed that the result of the new technology/innovation was simply a shift in the performance frontier. It is also important to be aware of the possibility that a new technology can change the shape as well as the location of the performance frontier. Such a change in shape can have important implications regarding choosing a location on the new frontier as well as the nature of the tradeoff facing the industry. In either case, the way to beat your competition is through developing or using new technology to move to a new frontier.

Focus

In the past, firms primarily competed on one factor, such as low cost, or innovation, because that was what they were good at. Obviously, they could not ignore the other factors of competition, which they had to do acceptably on, but their heavy attention to their one strength was based on a strategic framework called focus (Skinner 1974).

McKinsey & Company, a top management consulting firm, studied 27 outstanding successful firms to find their common attributes. Two of the major attributes reported in Business Week are directly related to focus:

1. **Stressing one key business value.** At Hewlett-Packard, the key value is developing new products; at Dana Corporation, it is improving productivity.

2. **Sticking to what they know best.** All the outstanding firms define their core capabilities (or strengths) and then build on them. They resist the temptation to move into new areas or diversify.

When an organization chooses to stress one or two key areas of strength, it is referred to as a focused organization. For example, IBM is known for its customer service, General Electric for its technology, and Procter & Gamble for its consumer marketing. In general, most but not all areas of focus relate to operations. Some firms, such as those in the insurance industry, focus on financial strength and others focus on marketing strengths. For example, Harley-Davidson considers its strength to be in building relationships with its dealers and motorcycle owners. And many health care organizations are achieving significant operational efficiencies by focusing on a narrow range of ailments. For example, by treating only long-term acute cases, Intensiva HealthCare has been able to reduce its costs to 50 percent of those
of a traditional intensive-care ward. Clearly, adapting a focus strategy means knowing not only what customers to concentrate on but also knowing what customers you do not want.

Table 1.5 identifies several areas of focus that organizations commonly choose when forming their competitive strategy; all are various forms of differentiation. Recent competitive behavior among firms seems to be dividing most of the factors in Table 1.5 into two sets that Terry Hill (2000), an operations strategist and researcher in England, calls order qualifiers and order winners. An order qualifier is a characteristic of the product or service that is required if the product is even to be considered or in the running. In other words, it is a prerequisite for entering the market. An order winner is a characteristic that will win the bid or the purchase. These qualifiers and winners vary with the market, of course, but some general commonalities exist across markets. For example, response time, performance, customization, innovation, and price seem to be frequent order winners, and the other factors (e.g., quality, reliability, and flexibility) tend to be order qualifiers. Working with marketing and sales to properly identify which factors are which is clearly of major strategic importance.

Table 1.5 • Common Areas of Organizational Focus

- **Innovation**: Bringing a range of new products and services to market quickly
- **Customization**: Being able to quickly redesign and produce a product or service to meet customers’ unique needs
- **Flexibility of products and services**: Switching between different models or variants quickly to satisfy a customer or market
- **Flexibility of volume**: Changing quickly and economically from low-volume production to high volumes and vice versa
- **Performance**: Offering products and services with unique, valuable features
- **Quality**: Having better craftsmanship or consistency
- **Reliability of the product or service**: Always working acceptably, enabling customers to count on the performance
- **Reliability of delivery**: Always fulfilling promises with a product or service that is never late
- **Response**: Offering very short lead times to obtain products and services
- **After-sale service**: Making available extensive, continuing help
- **Price**: Having the lowest price

In addition to the advantages of being focused, there are also some dangers. A narrowly focused firm can easily become uncompetitive in the market if the customers’ requirements change. In addition to being focused, a firm must also be flexible enough to alter its focus when the need changes and to spot the change in time. Frequently, a focus in one area can be used to an advantage in another way, if there is enough time to adapt—for example, to move into a new product line or alter the application of the focus. Moreover, as products go through their life cycle, the task of operations often changes, as shown in Figure 1.12, from being flexible enough to accept changes in design, to meeting the growing demand in the market-
Throughout this life cycle, the focus of the organization has to change, if it stays with the same output. Many firms, however, choose to compete at only one stage of the life cycle and abandon other stages, so that they can keep the strength of their original focus.

An organization can also easily lose its focus. For example, in the traditional functional organization, purchasing may buy the cheapest materials it can. This requires buying large quantities with advance notice. Scheduling, however, is trying to reduce inventories so it orders materials on short notice and in small quantities. Quality control is trying to improve the output, so it carefully inspects every item, creating delays and extensive rework. In this example, each functional department is pursuing its own objectives but is not focusing on how it can support the organization's overall business strategy.

However, the most common reason a firm loses its focus is simply that the focus was never clearly identified in the first place. Never having been well defined, it could not be communicated to the employees, could therefore not gain their support, and thus was lost. Sometimes a focus is identified but not communicated throughout the organization, because management thinks that lower-level employees don't need to know the strategic focus of the firm in order to do their jobs.

The Sand Cone

For many organizations that relied on the focus framework of strategy, the traditional view was that competing on one competitive dimension required trading off performance on one or more other dimensions (e.g., higher quality results in higher costs). However, research suggests that, at least in some cases, building strengths along alternative competitive dimensions may in fact be cumulative and that building a strength on one dimension may facilitate building strengths on other dimensions (Ferdows and De Meyer 1990).

Furthermore, according to this research there is a preferred order in developing strengths on various competitive dimensions. According to the Sand Cone Model (as it is called) shown in Figure 1.13, organizations should first develop the capability to...
produce quality outputs. Once an organization has developed this proficiency, it is next appropriate to address the issue of delivery dependability. Next, according to the model, the competitive dimensions of speed and cost should be addressed, respectively.

In addition to providing guidance to organizations regarding the order in which to focus their attention and initiatives, the model has intuitive appeal. For example, it makes little sense to focus on improving delivery dependability before an organization can provide a consistent level of quality. In today’s competitive marketplace, providing defective outputs in a timely fashion is not a recipe for long-term success. Likewise, organizations should achieve consistent quality levels and delivery dependability before attempting to reduce lead times. Of course, the model is not set in stone (remember it is called the Sand Cone) and organizations facing different circumstances may choose to address the competitive dimensions in a different order. We will return to these critical competitive factors in the final section of this chapter.

Core Capabilities

One important result of developing a business strategy is identifying the organization’s core competencies and capabilities that provide those product/service dimensions important to customers and hence the source of customer value. Core competencies (Prahalad and Hamel 1990) are the collective knowledge and skills an organization has that distinguish it from the competition. In effect, these core competencies become the building blocks for organizational practices and business processes, referred to as core capabilities (Stalk et al. 1992). (Hereafter we will refer to both of these simply as “core capabilities.”) The importance of these core capabilities derives from their strong relationship to an organization’s ability to integrate a variety of technologies and skills in the development of new products and services. Clearly, then, one of top management’s most important activities is the identification and development of the core capabilities the organization will need to successfully execute the business strategy.

In effect, core capabilities provide the basis for developing new products and services and are a primary factor in determining an organization’s long-term competitiveness. Hammer (2004) points out the importance of “operational innovation” in the organization as one basis for sustained competitive advantage, the clear result of a core capability. Therefore, two important parts of strategic planning are identifying
and predicting the core capabilities that will be critical to sustaining and enhancing the organization’s competitive position. On this basis, an organization can also assess its suppliers’ and competitors’ capabilities. If the organization finds that it is not the leader, it must determine the cost and risks of catching up with the best versus the cost and risks of losing that core capability.

Hayes and Pisano (1994) stress the importance of a firm not looking for “the” solution to a current competitive problem but rather the “paths” to building one or two core capabilities to provide the source of customer value for the indefinite future. Moreover, the firm should not think in terms of “tradeoffs” between core capabilities (e.g., moving from flexibility as a strength to low cost), but rather “building” one capability on top of others, and which set will provide the most customer value.

Often, it is more useful to think of an organization in terms of its portfolio of core capabilities, rather than its portfolio of businesses or products. For instance, Sony is known for its expertise in miniaturization; 3M for its knowledge of substrates, coatings, and adhesives; Black and Decker for small electrical motors and industrial design; Boeing for its ability to integrate large-scale complex systems; and Honda for engines and power trains. Had Sony initially viewed itself as primarily a manufacturer of Walkmans, rather than as a company with expertise in miniaturization, it might have overlooked several profitable opportunities, such as entering the camcorder business. As another example, Boeing has successfully leveraged its core capability related to integrating large-scale systems in its production of commercial jetliners, space stations, fighter-bombers, and missiles.

As these examples illustrate, core capabilities are often used to gain access to a wide variety of markets. Cannon used its core capabilities in optics, imaging, and electronic controls to enter the markets for copiers, laser printers, cameras, and image scanners. In a similar fashion, Honda’s core capabilities in engines and power trains comprise the basis for its entry into other businesses: automobiles, motorcycles, lawn mowers, and generators.

In addition to providing access to a variety of markets, a core capability should be strongly related to the benefits provided by the product or service that customers value. In Sony’s case, its expertise in miniaturization translates directly into important product features such as portability and aesthetic designs. Alternatively, suppose Sony developed a core competence in writing understandable user manuals. Since people who purchase a Walkman or camcorder rarely base their purchase decision on the quality of the user manual (when was the last time you read a user manual?), this core capability would provide little if any competitive advantage.

Another characteristic of core capabilities is that they should be difficult to imitate. Clearly, no sustainable competitive advantage is provided by a core capability that is easily imitated. For example, Sony’s expertise in miniaturization would mean little if other electronics manufacturers could match it simply by purchasing and taking apart Sony’s products (this is called reverse engineering). Bartmess and Cerny (1996) identify three elements of a core capability that hinders imitation:

- It is complex and requires organizational learning over a long period of time
- It is based on multiple functional areas, both internal and external to the organization
- It is a result of how the functions interact rather than the skills/knowledge within the functions themselves.
The topic of core capabilities is also strongly related to the recent surge in outsourcing and offshoring. **Outsourcing**—an approach increasingly common—involves subcontracting out certain activities or services. For example, a manufacturer might outsource the production of certain components, the management and maintenance of its computer resources, employee recruitment, or the processing of its payroll.

When we consider the concept of core capability, it is important to recognize that not all parts, services, or activities are equal. Rather, these activities and parts can be thought of as falling on a continuum ranging from strategically important to unimportant. Parts and activities are considered strategically important when:

- They are strongly related to what customers perceive to be the key characteristics of the product or service.
- They require highly specialized knowledge and skill, a core capability.
- They require highly specialized physical assets, and few other suppliers possess these assets.
- The organization has a technological lead or is likely to obtain one.

Activities that are not strategic or core are candidates for outsourcing. These parts or activities are not strongly linked to key product characteristics, do not require highly specialized knowledge, do not need special physical assets, and the organization does not have the technological lead in this area. Thus, if it is beneficial to outsource these parts or activities—perhaps because of lower cost or higher quality—no loss in competitiveness should result. On the other hand, when a firm’s strategic parts and activities have been outsourced, particularly to a foreign supplier, called **offshoring**, the firm has become hollow (Jonas 1986). As we have stated, the wise firm will outsource only nonstrategic, simple, relatively standard parts and processes such as screws or types of processes that are not worth the time for the firm to produce itself; the complex, proprietary parts and processes that give their products an edge in the marketplace are produced internally. If the firm outsources these parts and processes as well, it soon finds that the engineering design talent follows the production of the part outside the firm, too, and its core capabilities have been lost. Then, the firm has been **hollowed out**, becoming merely a distributor of its supplier’s products.

Given the huge potential effects of outsourcing, both positive and negative, a firm should consider such a move very carefully. They need to think about the long-term and short-term effects. And they also need to consider the impact of this decision on their core capabilities, and everything else they do within the company. Such a major decision as outsourcing will affect other decisions as well, such as sourcing materials, hiring/releasing labor and management, marketing, finance, and a wide range of other areas.

So what is the problem? If a supplier can deliver the parts at lower cost and better quality when they are needed, why not use them? The problem is that the supplier gains the expertise (and core capabilities) to produce the critical parts you need, and as Hayes and Pisano (1994), among others, note: organizations quickly forget how they produced those critical parts. After a while, when the supplier has improved on the process and you have forgotten how to make the parts, it is likely to start competing with you, producing the products you have been selling and dropping you as a customer. This is even more dangerous if, as already noted, the product and
transformation system has also been hollowed out, following the production activities to the supplier. This happened extensively in the television industry, where the Japanese learned first how to produce, and then how to engineer black-and-white and, later, color television sets. They then started tentatively introducing their own brands, to see if U.S. customers would buy them. Their products were inexpensive, of high quality, and caught on quickly in the free-enterprise American markets. The Japanese now virtually control this industry, as illustrated in one of our opening examples.

Outsourcing is a growing trend among U.S. manufacturers. The Big Three U.S. automakers are well-known examples of manufacturers that extensively outsourced for years. As other examples, Deere & Co. puts its name on midrange utility tractors produced by a Japanese company, and Agco Corp. outsources the production of almost all of the transmissions and engines used in its farm equipment. Of course, not all manufacturers are jumping on the outsourcing bandwagon. New Balance Athletic Shoes, for example, invested $25 million in its manufacturing facilities as part of an overall strategy to do more assembly in-house.

Kodak’s Business Imaging Systems Division (BIS) is one firm that looked into offshoring and decided against it (Bartmess and Cerny 1996). Initially they took the “traditional” perspective and discovered that overseas wage rates were 75 percent cheaper than domestic rates. [Note: Recent research reveals that wages in China are now commonly 96 percent cheaper than domestic U.S. wages!] The traditional perspective is one dominated by considering only current conditions with no thought about the future, a short-term response to a competitive threat, a heavy emphasis on cost (primarily labor), and a singular focus on one function, typically operations, to the exclusion of other functions such as engineering, marketing, and design.

But then BIS considered a capabilities perspective and discovered that:

- Offshore productivity was also low, negating the benefit of low wage rates.
- Large overhead costs were primarily fixed and would not shrink with overseas labor.
- Engineering would also have to accompany manufacturing overseas, but offshore engineering wages were almost equal to domestic wages. Moreover, BIS did not want to lose their domestic engineering competence.
- Over time, foreign wages would be increasing: “...once trained and experienced, labor does not stay cheap very long.”
- Cost advantages almost equal to the benefit of low offshore wages were available through product redesigns.

BIS hence decided not to move their operation overseas, though they did decide to start an offshore plant for a low-end product for the foreign market, mainly to educate themselves in the advantages and disadvantages of offshore production as well as to learn ways to improve their internal low-cost manufacturing capabilities. (For another view on offshoring, see Markides and Berg 1988.)

Regarding the purpose for outsourcing, it is also important to be aware of another danger of outsourcing activities or parts primarily on the basis of “cost.” To illustrate, assume a manufacturer produces four product lines each with an annual volume of 100,000 units. Further assume that the company’s overhead is £1.2 million (British pounds). Allocating this overhead evenly across the four product lines would result
in each unit being allocated £3 in overhead charges. Now suppose that in the interest of lowering its cost and increasing its competitiveness, the manufacturer investigates outsourcing products that can be produced at lower unit costs by external suppliers. In fact, suppose that a supplier is found for one of its product lines. What is the impact of outsourcing this product line? Clearly on one hand, the company obtains the product at a lower unit cost. But what is the impact on the remaining product lines and the organization’s overhead?

More than likely, outsourcing one product line will not have a dramatic impact on total overhead; however, the amount of overhead each unit must now absorb increases from £3/unit to £4/unit. In effect, each unit now appears to be more expensive to produce internally. Thus, outsourcing other product lines now appears to be warranted and likely will be investigated. As you can see, this logic results in a vicious cycle commonly referred to as the *creeping breakeven phenomenon*. As outputs are outsourced, the remaining outputs appear to be more expensive to produce in-house. This creates an incentive to outsource even more outputs. The logical conclusion of this process is that the organization ends up producing no outputs and going bankrupt.

Now that the subject of operations strategy has been described, we are ready to tackle the operations concepts that reflect this strategy in the remainder of the book. In general, there are two main sets of concepts that need to be discussed. One set is the major functions of operations that impact strategy, and the other is the three integrated thrusts we see occurring in organizations today: supply chain management, six sigma for improving processes, and lean for improving processes.

The book is divided into three parts: I: Operations Strategy, II: Operations Processes, and III: Supply Chain Management. We have just finished the first part, consisting solely of Chapter 1: Operations Strategy and Global Competitiveness. The others are discussed below.

**Part II: OPERATIONS PROCESSES**

**Chapter 2:** Process Planning and Design—this chapter describes the various ways of organizing the transformation processes and each of their advantages and disadvantages. Such processes represent one of the major functions of operations.

**Chapter 3:** Controlling Processes—in this chapter, we describe the control element of the production system, with special attention to quality control as our primary example.

**Chapter 4:** Process Improvement: Reducing Variation Through Six Sigma—we devote two chapters to the major thrusts in industry today to improve their processes. This chapter focuses on the use of the six sigma approach to follow up on the control element in Chapter 3, where the production
Chapter 1: Operations Strategy and Global Competitiveness

Processes have been found to need improvement in terms of reducing their variation.

Chapter 5: Process Improvement: Eliminating Waste Through Lean—here we investigate techniques to further improve the production processes by eliminating waste in processes, thereby saving cost, effort, and time.

Chapter 6: Managing Process Improvement Projects—having decided on our production processes, or ways to improve them, we now need to execute on our plan. This is done through the procedures of project management. We illustrate the procedures with a process improvement example, but project management can be applied to many other activities that organizations undertake, and especially activities involving change.

Part III: Supply Chain Management

Chapter 7: Managing the Supply Chain—in this chapter we cover a range of topics that involve the supply chain such as inventory, material requirements planning and enterprise requirements planning, logistics, purchasing, and many others.

Chapter 8: Capacity, Scheduling, and Location—this chapter completes the description of the major functions of operations.

Expand Your Understanding

1. Why is it so hard to increase productivity in the service sector?
2. Identify other major differences between services and products in addition to those listed in Table 1.1.
3. Many foreign firms have been successful in the following areas: steel, autos, cameras, radios, and televisions. Are services more protected from foreign competition? How?
4. It is commonly said that Japanese firms employ 10 times as many engineers per operations worker as U.S. firms and 10 times fewer accountants. What effect would you expect this to have on their competitiveness? Why?
5. How might the concept of a “facilitating good” alter the way we perceive a product? A service?
6. Is it wise for a firm to stick to what it knows best, or should it expand its market by moving into adjoining products or services? How can it avoid losing its focus?
7. What do you think the result will be of the continuing escalation of the U.S. trade deficit? Will a gradual devaluation of the dollar solve the “problem?” If it does, what do you think will be the resulting effect on the United States?
8. Can you think of any other areas of possible focus for a firm besides those identified in Table 1.5?
9. What core capabilities do you think China possesses? India? Japan? The United States?
10. According to K. Blanchard and N. V. Peale (The Power of Ethical Management, New York: Morrow, 1988), the following three ethical tests may be useful: (1) Is it legal or within company policy? (2) Is it balanced and fair in the short and long term? (3) Would you be proud if the public or your family knew about it? Apply these tests to the following situations:
   a. A foreign firm subsidizes its sales in another country.
   b. A foreign firm dumps its products (sells them for less than cost) in another country.
   c. A country imports products that, had they been made domestically, would have violated domestic laws (e.g., laws against pollution).
11. In responding faster to customers’ needs, where might the cost savings come from? What benefits would result?
12. Can you think of companies that have moved the performance frontier of their industries?

13. Why do Americans invest more in marketing new products while the Japanese invest more in engineering? What advantages accrue to each investment?

14. Using new technologies, it is not uncommon for firms to cut their response times by a factor of ten. What effect would you expect this to have on their unit costs?

15. With the increasing trend of offshoring in the United States, although companies may get richer, what will happen to their workers? What will the future hold?

16. What are the order winners and order qualifiers for Wal-Mart? Toyota? BMW? Sony?

17. Given the recent trends in products and services, does the focus strategy or sand cone strategy seem most applicable these days?

18. Why don’t we see more mass customization in products and services?

**APPLY YOUR UNDERSTANDING**

**Incident 1: Taracare, Inc.**

Taracare, Inc. operates a single factory in Ensenada, Mexico, where it fabricates and assembles a wide range of outdoor furniture for the USA market, including chairs, tables, and matching accessories. Taracare’s primary production activities include extruding the aluminum furniture parts, bending and shaping the extruded parts, finishing and painting the parts, and then assembling the parts into completed furniture. Upholstery, glass tabletops, and all hardware are purchased from outside suppliers.

Jorge Gonzalez purchased Taracare in 2001. Before that, Jorge had distinguished himself as a top sales rep of outdoor furniture for the western region of one of the leading national manufacturers. However, after spending 10 years on the road, Jorge wanted to settle down and spend more time with his family back in Mexico. After searching for a couple of months, he came across what he believed to be an ideal opportunity. Not only was it in an industry that he had a great deal of knowledge about, but he would be his own boss. Unfortunately, the asking price was well beyond Jorge’s means. However, after a month of negotiation, Jorge convinced Jesus Garza, Taracare’s founder, to maintain a 25 percent stake in the business. Although Jesus had originally intended to sell out completely, he was impressed with Jorge’s knowledge of the business, his extensive contacts, and his enthusiasm. He therefore agreed to sell Jorge 75 percent of Taracare and retain 25 percent as an investment.

Jorge’s ambition for Taracare was to expand it from a small regional manufacturer to one that sold to major national retailers. To accomplish this objective, Jorge’s first initiative was to triple Taracare’s sales force in 2002. As sales began to increase, Jorge increased the support staff by hiring an accountant, a comptroller, two new designers, and a purchasing agent.

By mid-2005, Taracare’s line was carried by several national retailers on a trial basis. However, Taracare was having difficulty both in meeting the deliveries its sales reps were promising and in satisfying the national retailers’ standards for quality. To respond to this problem, Jorge hired Alfredo Diaz as the new manufacturing manager. Before accepting Jorge’s offer, Alfredo was the plant manager of a factory that manufactured replacement windows sold by large regional and national retailers.

After several months on the job—and after making little progress toward improving on-time delivery and quality—Alfredo scheduled a meeting with Jorge to discuss his major concerns. Alfredo began:

I requested this meeting with you, Jorge, because I am not satisfied with the progress we are making toward improving our delivery performance and quality. The bottom line is that I feel I’m getting very little cooperation from the other department heads. For example, last month purchasing switched to a new supplier for paint; and although it is true that the new paint costs
less per gallon, we have to apply a thicker coat to give the furniture the same protection. I haven’t actually run the numbers, but I know it is actually costing us more, in both materials and labor.

Another problem is that we typically run a special promotion to coincide with launching new product lines. I understand that the sales guys want to get the product into the stores as quickly as possible, but they are making promises about delivery that we can’t meet. It takes time to work out the bugs and get things running smoothly. Then there is the problem with the designers. They are constantly adding features to the product that make it almost impossible for us to produce. At the very least, they make it much more expensive for us to produce. For example, on the new “Destiny” line, they designed table legs that required a new die at a cost of 250,000 pesos. Why couldn’t they have left the legs alone so that we could have used one of our existing dies? On top of this, we have the accounting department telling us that our equipment utilization is too low. Then, when we increase our equipment utilization and make more products, the finance guys tell us we have too much capital tied up in inventory. To be honest, I really don’t feel that I’m getting very much support.

Rising from his chair, Jorge commented:

You have raised some important issues, Alfredo. Unfortunately, I have to run to another meeting right now. Why don’t you send me a memo outlining these issues and your recommendations? Then perhaps I will call a meeting and we can discuss these issues with the other department heads. At least our production problems are really no worse than that of our competitors, and we don’t expect you to solve all of our problems overnight. Keep up the good work and send me that memo at your earliest convenience.

Questions

1. Does Alfredo’s previous experience running a plant that made replacement windows qualify him to run a plant that makes outdoor furniture?
2. What recommendations would you make if you were Alfredo?
3. Given Jorge’s background and apparent priorities, how is he likely to respond to Alfredo’s recommendations? On the basis of this likely response, is it possible to rephrase Alfredo’s recommendations so they are more appealing to Jorge?

Incident 2: Izmir National University

Izmir National University (INU) was chartered in 2000 to facilitate Turkey’s expected eventual entry into the economy of Europe, via the EU. To foster growth and development in the European economy, engineering, science, and business were deemed to be the institution’s primary areas of intellectual endeavor. The university grew rapidly during its first three years. By 2005, the enrollment reached just over 9300 students. However, with this rapid growth came a number of problems. For example, because the faculty had to be hired so quickly, there was little real organization, and curriculum seemed to be decided on the basis of which adviser a student happened to consult. The administrative offices were often reshuffled, with vague responsibilities and short tenures.

The faculty of the new Business School was typical of the confusion that gripped the entire university. The 26 faculty members were mostly recent graduates of doctoral programs at major European and Turkish universities. There were 21 Assistant Docents and Lecturers, 3 Docents, and 2 full Professors, spread fairly evenly over the four Departments, each overseen by a Kürşü professor (department head). In addition, funds were available to hire 3 additional faculty members, either assistant or regular Docents. The background of the newly recruited Dekan (administrative head, dean) of the Business School included five years of teaching at a primarily Muslim university in Turkey and two years of departmental administration at a large southern European university.
Upon arriving at the Business School, the Dekan asked the faculty to e-mail their concerns to her so that she could begin to get a handle on the major issues confronting the school. Her office assistant selected the following comments as representative of the sentiments expressed.

- “Our student-teacher ratio is much higher than what it was at my former university. We need to fill those open slots as quickly as possible and ask the university to fund at least two more faculty positions.”
- “If we don’t get the quality of enrollments up in the MBA program, the Graduate School will never approve our application for a doctoral program. We need the doctoral program to attract the best faculty, and we need the doctoral students to help cover our courses.”
- “Given that research is our primary mission, we need to fund more graduate research assistants.”
- “The travel budget isn’t sufficient to allow me to attend the meetings I’m interested in. How can we improve and maintain our visibility if we get funding for only one meeting per year?”
- “We need better staff support. Faculty members are required to submit their exams for copying five days before they are needed. However, doing this makes it difficult to test the students on the material covered in class right before the exam, since it’s difficult to know ahead of time exactly how much material we will cover.”
- “I think far too much emphasis is placed on research. We are here to teach.”
- “Being limited in our consulting is far too restrictive. In Europe we were allowed one day a week. How are we supposed to stay current without consulting?”
- “We need a voice mail system. I never get my important messages.”

Questions

1. What do the comments by the faculty tell you about INU’s strategy?
2. What would you recommend the Dekan do regarding the Business School’s strategic planning process? What role would you recommend the Dekan play in this process?
3. Productivity is defined as the ratio of output (including both goods and services) to the input used to produce it. How could the productivity of the Business School be measured? What would the effect be on productivity if the faculty all received a 10 percent raise but continued to teach the same number of classes and students?

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