Strategic Issues of Information Technology

Abstract

We have already shown how IT can transform organizations and industries when used in strategic applications. Examples in this chapter, plus our earlier discussions of the securities and airline industries, demonstrate the power of modem information technology to change businesses. As technology becomes integrated with strategy, the nature of business changes. Baxter Laboratories spun off Allegiance, a firm dedicated to providing hospital supplies and to helping hospitals manage their costs through information technology. A few years later, Cardinal Health Care bought Allegiance ! Rosenbluth Travel, a firm discussed in this chapter, changed its focus from providing bookings and tickets to helping a company manage its travel costs through the creative use of technology. Technology and strategy are responsible for major changes in the structure and operations of the organization .

A recent poll of more than 200 executives showed that they feel information technology is key to a competitive advantage. However, 52 percent of these managers also feel that they are not getting their money's worth from the technology. Andersen Consulting conducted the study, which involved chief executives, chief operating officers, and chief financial officers representing companies with annual sales ranging from $250 million to $20 billion. This chapter discusses how technology can be used to gain a strategic, competitive advantage. We believe that many of the problems expressed by the executives in the survey just mentioned come from their failure to actively manage IT in the firm. After we discuss IT and strategy, we present some ideas on how you should manage technology so that it can contribute to corporate strategy. What is competitive advantage? A firm has a competitive advantage when it is able to perform some function "better" than its competitors. Better may mean that it has a superior product, the most efficient manufacturing process, unique knowledge, or some other capability that its competitors lack. As an example, Intel considers its knowledge of how to build and operate a semiconductor manufacturing plant a competitive advantage. Some argue that Microsoft's control of the operating system provides it with too much of a competitive advantage in selling PC software, especially Web browsers. After obtaining a competitive advantage, the firm faces the challenge of sustaining it as competitors fight back.

INFORMATION TECHNOLOGY AND CORPORATE STRATEGY

A key task of top management is formulating corporate strategy. What opportunities for new directions are available? What are competitors doing? A firm can continue its present course, maintaining momentum where it is doing well. Alternatively, the corporation can dramatically change its strategy by deciding among competing alternatives for new ventures. What is the role of technology in its strategy?

At Brun Pas sot we saw how IT and strategy become intertwined, with each influencing the other. A well-managed firm will strive for this kind of integration.

Some Examples of Technology and Strategy

Merrill Lynch is the largest stockbrokerage firm in the United States and plans to become one of the major financial institutions in the world. Two decades ago, funds in a customer's brokerage account earned no interest. There could be cash in such an account because of the sale of stock or because of dividends on stock held by Merrill Lynch for the client. The firm developed a new financial product called the cash management account. At the time the

product was conceived, interest rates were extremely high and a number of small investors were keeping their funds in liquid assets accounts. These funds buy and hold large securities with a value of $100,000 or more. The investor buys shares, usually with a par value of $ 1 . The account requires a minimum deposit, possibly as low as a few thousand dollars. The funds keep the value of the ownership units at $1 by varying the dividends and buying short-term securities. Now the small investor, instead of being limited to bank or savings and loan passbook accounts, can take advantage of higher interest rates previously

available only to those with a large amount to invest. (Today banks and S&Ls are able to offer money market accounts, but they were not available at the time Merrill Lynch developed its new account.)

The firm decided an account that automatically invested idle cash in Merrill Lynch's own Ready Assets (liquid assets) Fund would appeal to its customers. In fact, the CMA (cash management account) is like a bank account and brokerage account combined. The customer can write checks against the account and even receive a bank charge card.

Has it been successful? At first the account was slow to win acceptance, but today Merrill Lynch has more than a million CMA customers. Other brokerage firms have hired Merrill Lynch employees to develop similar products. Merrill Lynch patented the account and asked for licensing fees from other brokers . In an out-of-court settlement, another brokerage firm agreed to pay $ 1 million for hiring a Merrill Lynch employee to set up a similar system. Merrill Lynch gained a significant competitive advantage with its cash management account

system. Could this system have developed without confidence in information technology?

With a million accounts to update, the magnitude of the catastrophe if computer systems do not work is hard to imagine. In fact, this product could never be offered unless a firm had computer technology and could manage it. The volume of updating and the short time requirements would be just too great for a manual system.

On a smaller scale, information processing technology made it possible for a new market research firm to offer a service it could not obtain from its competitors. The company developed a strategy that is intertwined with information technology. The firm purchased grocery store point-of-sale scanning equipment and, at first, gave it free to 15 supermarkets in two towns selected on the basis of their demographic makeup. There are 2000 households in each of the two test markets using the scanning equipment, and purchases are recorded on the firm's computer in Chicago. Since each product is marked with the universal product code, researchers can pinpoint a family's purchases by price, brand, and size, and then correlate the purchase information with promotions such as coupons, free samples, price adjustments, advertising, and store displays. With this technology the company can conduct careful, scientific tests of marketing strategies to determine the most effective approach for its customers. For example, through cooperation with a cable TV network, the firm can target different TV commercials to selected households and analyze the resulting purchases.

The imaginative use of the technology has allowed the firm to gain a competitive lead over much larger, more well-established market research firms. This firm has grown and recently was able to sell the software it developed for analyzing scanner data for a premium price.

These examples illustrate how the integration of information-processing technology with strategy formulation expanded the opportunities for each firm. In the brokerage firm, the technology made it possible to offer a new service that helped expand the firm's market share and increased the size of its liquid assets fund. Technology helped the market research firm gain a competitive edge and set a new standard for service in the industry.

The Value Chain

Michael Porter at Harvard has popularized the concept of the "value chain," the activities in an organization that add value to its products or services (Porter and Millan, 1985). See Figure 5 1 . The primary activities in the value chain include inbound logistics, operations outbound logistics, marketing and sales, and service. Each of these activities adds value directly to the firm's output. Supporting these primary activities are the firm's infrastructure, human resource management, technology development, and procurement. What is the potential impact of information technology on the value chain? IT can create dramatic changes here. Consider Calyx and Carolla from the last chapter: Growers provide inbound logistics and FedEx is responsible for outbound logistics. Two alliance partners, linked by electronic communications in the case of growers, provide important components of the primary value chain. Various credit card companies provide part of the firm' s infrastructure, accounts receivable. There are

similar examples for all of the activities in Figure 5-1 ; IT can and does have a profound impact on the value chain.
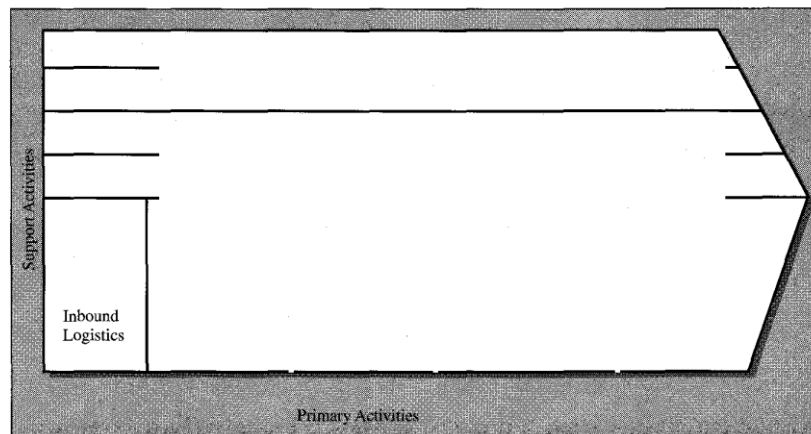
Some Generic Strategies

Porter elaborates on his value chain analysis and suggests that firms follow one of three generic strategies:

1. **Low-cost producer** . Here the firm tries to have the lowest costs in the industry so that it can compete on price.

2. **Differentiation**. The firm tries to separate its product image from that of the competition in such a way that the customer wants its product. Luxury automobile manufacturers like BMW are very adept at differentiating their products from other cars. For example, if you buy a BMW, you are said to have "the ultimate driving machine."

3. **Market niche strategy**. A number of firms try to find a market niche and exploit it. A niche is some part of a market that is not being served by others. Hermes has stayed in its niche of producing high-quality, expensive products like women's scarves for a limited clientele. In today's competitive economy, we have observed firms focusing on more specific strategies that are listed below. Most of the time, the firm adopts only one of these, but it is possible to follow two at the same time:

Customer Driven . Here the firm focuses on its customers. How can we provide better customer service? How can we design products that meet our customers' needs? What technology exists so we can better serve our customers? Customer service is extremely important in commodity businesses, for example, the mailorder sales of personal computers.

Reducing Cycle Times . A firm has a variety of cycle times; a typical one is the length of time it takes to design a new product or service. Detroit automobile manufacturers and Boeing are focusing on reducing cycle times. They now use parallel design and engineering where tasks are done simultaneously rather than sequentially. In addition to saving time, parallel development results in better coordination among team members working on the design of a new car or plane.

Global Competition . As the unification of Western Europe continues and Asian economies become more open, some firms have decided to follow a strategy of competing in the global marketplace rather than only in local markets . A firm with global presence will need a variety of technologies to help coordinate and control all its activities. Information technology is a great facilitator for global operations.

Right-Sizing. In the U.S., the first part of the 1980s was an economic boom, leading to a number of excesses. The late 1980s and the early 1990s were marked by economic downturns and slow growth. To compete in a difficult economy, firms have attempted to determine their "right size." Usually to right-size meant a serious reduction in the number of workers in the firm, and rather large write-offs for restructuring. Blue-chip companies such as IBM have reduced their levels of employment by tens of thousands of workers.

Quality . Japanese manufacturers gained a large market share in a number of industries partially through a fanatical devotion to quality. Many firms around the

world are focusing on quality in the hopes of getting ahead of the competition. Quality is an obvious component in the manufacturing sector, but the services firm can also be concerned about the quality of its output. As we shall see in the rest of the text, there are many ways that technology can be used to support the generic strategies just described.

A Framework for the Strategic Use of IT

Figure 5-2 shows a framework for IT strategy that arrays a firm's existing applications
against those that are currently under development (Applegate, McFarlan, and McKenney, 1 999).

FIGURE 5·2
Information systems strategic grid.
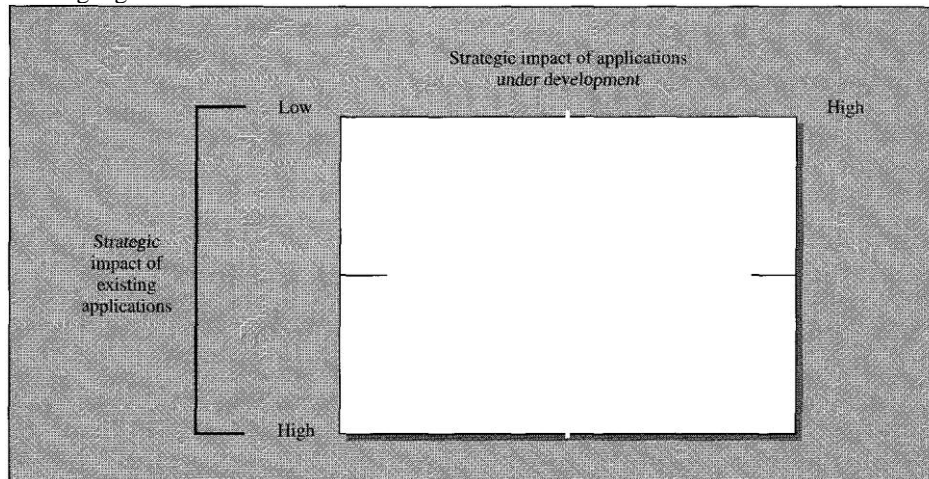
Companies that are "located" in the strategic cell are critically dependent on the smooth functioning of information systems. These firms need significant amounts of planning and would be at a considerable disadvantage if information processing did not perform properly. The authors found one bank that fit this cell well. Without computers, the bank would be awash in a sea of paper and could not possibly keep up with the volume. The bank must think of how to use its systems strategically to offer services that will let it capture a greater market share. For instance, banks are offering new services connecting home computers to bank computers. In a turnaround company, there is a need for planning, too. It is likely that corporate performance is inhibited by poor performance in the information-processing department. Applegate and her colleagues found a firm in this cell with adequate operating systems in production but limited new applications critical for keeping up with growth. Without new technology the firm could not maintain control over its rapidly expanding operations.

The authors argue that in the factory setting, there is not much to do but run existing applications. They maintain that strategic goal setting and linkage of information systems to the corporate plan are not too important here.

Finally, in a support environment, information processing is probably not critical to the firm, so strategic integration will not be essential for success. The authors expect to find low levels of senior management involvement in this situation.

This is the position of Applegate, McFarlan, and McKenney (1999) who argue that in the support cell, it is quite appropriate for management to be relatively uninvolved in information processing. Although this may be true for certain systems,

the advice is bad in general because it encourages management to ignore information technology and the new opportunities it provides. It is quite possible that a firm in the support cell will be able to come up with a strategic application that allows it to gain a competitive edge. In fact, if the support cell position is characteristic of the industry, the firm that first finds a strategic edge through information technology may in fact move far ahead of the competition.

The framework in Figure 5-2 is a useful one for diagnosing the state of an organization.

We can look at the nature of the business, its plans for the future, and its existing and planned applications. In a turnaround situation, we may want to emphasize to management the importance of leading the information systems effort, whereas in the strategic cell, management may already be aware of the importance of technology to the firm.

Those authors concerned with the use of information technology as a part of corporate strategy have all taken a slightly different approach to classifying systems.

One common thread seems to run throughout the discussions: Technology can contribute to a firm's strategy in a number of ways. It can reduce costs to help an efficient firm compete, and technology can tie the firm more closely to suppliers and customers. The technology can also become a product itself, such as the Merrill Lynch's CMA or an airline's CRS, discussed in Chapter 4. Both of these allowed firms to gain a significant competitive edge.

Capitalizing on Information Technology

How does the firm take advantage of information? There are four steps to be followed by top management:

1. Look for ways to incorporate technology in a product or service. Does information

processing provide an opportunity for a new approach to business? Does the technology make it possible to differentiate a product or service from that of the competition? Technology can help open a new market or increase an existing market share.

2. Seek ways to use technology to connect with other firms. There is great interest in interorganizational systems that link two organizations together. Your firm may be able to connect electronically to its customers so that it is easy for them to order from you. A firm can encourage its suppliers to provide links for placing orders. In these instances, the firms in question are drawn more closely together, making it difficult for the competition. These links include the Internet, which is becoming the connection mechanism of choice among firms.

3. Look for ways to use technology to make dramatic changes in the way you structure the organization. Use information technology organization design variables so management can structure an organization that is highly competitive, that uses its technologically enabled structure to become a formidable competitor. ITbased structures that focus on one of the strategies described earlier, for example, providing extraordinary customer service, can also provide an advantage.

4. Integrate technology with planning. To integrate technology with planning, managers have to understand (1) the operation of their business and (2) the capabilities of technology. In addition, the firm has to have invested in building a modern technological infrastructure so that it is ready to take advantage of new opportunities. Finally, management has to make information technology a part of its planning process.

One of the greatest impediments to using information technology for strategic purposes is an inability on the part of top management to successfully manage the

information systems function. If executives do not believe they can control information processing services, they probably will be unwilling to rely on this technology to accomplish strategic goals.

CREATING AND SUSTAINING A COMPETITIVE EDGE

There are different schools of strategy that describe how a firm gains and then sustains a competitive advantage. Theories by Teece (1986) and Barney (1 991) apply particularly well to the case of using information technology for achieving a competitive advantage.

Using Resources to Advantage

A firm has a number of resources available to it including its employees and their knowledge, capital, products and services, and physical resources that may include a significant investment in a production facility. Some of these resource are likely to give a firm a strategic advantage, but which ones? Resources, according to Barney (1991), must be valuable, rare, imperfectly inimitable, and nonsubstitutable to

provide an advantage. Otherwise a competitor can develop exactly the same resource without much cost and duplicate your firm's strategy.

A resource must be valuable enough that a competitor will think twice before trying to acquire or create a copy. A rare resource is more difficult for a competitor to acquire or copy. A strategic resource has to be "imperfectly inimitable" as well to deter creating a direct imitation. A resource has to be non substitutable so that a competitor cannot find an easy substitute in the form of a different, more accessible resource that is easy to acquire. Intel is an example of a company with resources that give it a competitive advantage. First, it has the knowledge of how to build and produce complex logic chips; Intel regards its ability to build and run a chip fabrication plant as a major competitive advantage. It has the knowledge and engineering resources to create and operate these plants that cost in excess of $ 1 billion. Intel is also large enough to have the financial resources to build such expensive plants. This combination of resources is valuable, rare, imperfectly inimitable, and nonsubstitutable.

Protecting an IT Innovation
Many innovations in IT are virtually impossible to protect from copying. It is difficult to copyright or obtain a patent on an application of technology. When Barney (1991)established a Web site to let customers inquire about the status of their shipments, United Parcel followed with a similar Web service within a month. The term "regimes of appropriability" is sometimes used to describe how easy it is to protect an innovation. A strong regime means you can protect an innovation, while weak appropriability means that others can easily duplicate your innovation. Most IT initiatives seem to have weak appropriability regimes. While a firm may have the appropriate resources to create an innovation, it can be difficult or impossible to sustain it.

There are, however, some conditions that favor the innovator. For example, if you have certain complementary assets (resources) that are unavailable to others, you may be able to protect your innovation. When IBM brought out its first personal computer in 1981, it had a strong complementary asset in the form of a marketing organization with contacts in major corporations around the world. A cospecialized asset is one that has mutual dependency with the innovation. A good example of a cospecialized asset is the relationship between Microsoft's Internet Explorer and Windows 98. The Explorer depends on Windows since it must run on a computer controlled by this operating system; as the Explorer interface becomes a part of Windows, the operating system develops a dependence on this browser. It has been suggested that location can be a co specialized asset in the placement of ATMs; the first banks that installed ATMs were able to get the best locations for them (Dos Santos and Peffers, 1995).

There may be ways to use the technology, itself, to strengthen your regime of appropriability; see Clemons and Weber (1991). One of the most popular ways to sustain an advantage is to be the first mover. The first mover may be able to create an insurmountable lead over the competition. Merrill Lynch has many imitators; in fact the "sweep account" is very common in the investment business. However, no one has been able to overtake Merrill Lynch' s lead; it has by far the largest number of cash management accounts of any other brokerage firm. Another way to sustain an advantage is to overwhelm the competition with technological leadership. United and American airlines have more than 70 percent of the domestic market for reservation systems in travel agencies. These firms had the resources to make large investments in technology and for developing skilled staff members who could implement reservation systems. The companies applied their resources to create the CRSs in the first place, and the CRSs themselves became resources for competing. Apollo and SABRE today are travel supermarkets that would be extremely difficult and expensive to imitate. By continuously investing in technology and managing it well, these two airlines provide significant barriers to entry for other airlines and vendors of potential reservation systems. (A consortium of several airlines now owns the original United CRS, Apollo.)

Closely related to technological leadership is continuous innovation. Successful strategic applications such as the classic American Hospital SupplylBaxter Health Care order entry system demonstrate continuous innovation. Today, with this system, Allegiance, a Baxter spin-off now a part of Cardinal Health Care,

offers a service that is the virtual inventory for a "stockless" hospital. IT and a superb logistics system let Allegiance promise just-in-time deliveries to different departments in a hospital.

A final approach to sustaining an advantage is to create high switching costs. By making it very expensive or inconvenient to switch a customer' s business to a competitor, you are assured that customers will continue to do business with you. The airline CRS vendors have been very clever at locking in travel agencies. At this time, almost all agencies in the U.S. are automated. Increases in the number of customers and market share only come from converting an agency from a competitor' s CRS to your own. Each CRS vendor has created very high switching costs for an agency to convert to a competitor's CRS.

Simply finding a strategic application of technology and implementing it successfully are not enough. This approach should provide a short-term competitive advantage, but the innovator must constantly be searching for ways to sustain an advantage as the competition tries to imitate its success. When planning and developing a strategy, think about the kinds of resources you have to provide an advantage and the difficulties of protecting an IT innovation. Do you have specialized or co specialized assets to enhance the innovation? Can you turn the IT innovation into a resource, itself, that is valuable, rare, inimitable, and nonsubstitutable through some combination of being the first mover, technological leader, continuous innovator, andlor the creator of high switching costs?

An Example of Technology for Competitive Advantage

Clemons and Row (1991) describe how a small travel agency expanded to a nationwide business through the use of IT. Rosenbluth Travel, headquartered in Philadelphia, grew from $40 million in sales in 1980 to $ 1 .3 billion in 1990. It is now one of the five largest travel management companies in the United States and has more than 400 offices.

According to the authors, Rosenbluth was extremely effective in taking advantage of the opportunities offered by deregulation in the travel industry. The firm has used technology to help manage the complexity of modem travel and to obtain economies of scale. Rosenbluth invested in IT over a period of years. While the expenditure in any one year was not inordinate, Rosenbluth created a technology base that is extremely difficult for a new entrant or even a competitor to match. Prior to deregulation in 1 976, travel agents wrote about 40 percent of all tickets. The role of the agent was only to make a reservation and distribute a ticket. Deregulation changed the role of travel agents and forced them to manage the increased complexity of travel. American Airline's SABRE system contains more than 50 million fares and processes 40 million changes a month. The airline reservation systems used by travel agents were biased toward the airlines, though no more so than one would find calling the airline itself for information. The travel agent, however, could be expected to help the client without a bias toward a particular airline. By 1 985 travel agencies were distributing more than 80 percent of air tickets .

Businesses are very interested in managing their travel. I t i s the third largest expense for most firms after payroll and information technology . Firms began to negotiate rates with airlines, hotels, and rental-car companies. One of Rosenbluth' s major business focuses has been the corporate travel market. See Figure 5-3. The following list of critical technology moves by Rosenbluth illustrates how the firm has used IT for expanding its business:

- In about 1 9 8 1 the firm experimented with processing data from airline computerized reservation systems (CRSs) to provide information for corporate accounts .
- I n 1 9 8 3 Rosenbluth introduced a product called READOUT that listed flights by fare instead of by time of departure. This program made it possible to see the fare implications of taking a particular flight. The normal flight display was by departure time, and the agent had to move to another screen to obtain fare information.
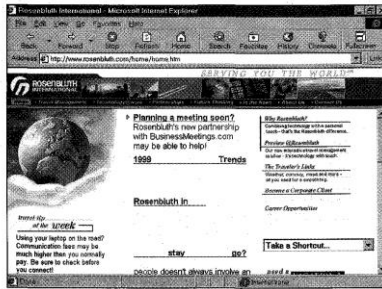
- In 1986 a proprietary back-office system, VISION, created a highly flexible reporting system for clients. The system created a record of transactions made for a client at the time of ticketing regardless of the location of the agency or the CRS in use. This system gave Rosenbluth independence from the data provided by the airline CRS. During 1986 Rosenbluth estimated that it invested nearly half of its pretax profit in the system. The VISION system was more flexible and produced reports about two months earlier than agencies using only the airline CRS. Rosenbluth used VISION to negotiate special fares with the airlines on heavily traveled routes the system identified. Instead of competing for corporate clients by offering to rebate part of its commissions, Rosenbluth tried to create a cooperative relationship with clients . It promised clients to reduce overall travel costs through lower fares and used VISION reports to document the savings.

- In 1988 Rosenbluth used a new feature in United's Apollo reservation system to support intelligent workstations. PRECISION, the new Rosenbluth system, made client and individual employee travel profiles, and READOUT, the database of flights listed by increasing fares, were made available to the booking agent. ULTRA VISION was another system that ran with the normal reservation process, monitoring transactions for accuracy and completeness.

- During 1990-91 , Rosenbluth began installing USERV ISION in its offices. This system lets the user make flexible queries about corporate travel. The data are one day old compared to the 45-day lag typical of the airline CRS data. These initiatives were part of a tremendous growth period as Rosenbluth's sales increased from $400 million in 1987 to $ 1 .3 billion in 1990 while the number of offices increased from 85 to over 400. The firm has been extremely successful. Business and technology strategy were developed together in an integrated approach to growth. The firm took risks in developing new uses of IT and in-house expertise to successfully implement systems. Rosenbluth's technology strategy competes through value-added services rather than being the low-cost producer through rebates. It also took advantage of technology to market new services to its clients. The company meets jointly with its clients and service providers to help the client negotiate the lowest possible fares.