

3 Strategy, Information Systems, and Competitive Advantage

This could happen to you



Madison finished her business degree and landed a great job working in the human resources department of a high-technology firm in Ottawa's Kanata district. The company grew rapidly. In a few short years, Madison rose quickly through the

ranks of the human resources department by demonstrating her ability to find and retain highly skilled employees. Her success had been recognized, and she was now the manager of employee recruitment for the company. Employees are a big source of the competitive advantage for the firm,¹ and Madison's job is central to the company's strategic objectives.

On an early evening skate down the Rideau Canal, one of Madison's friends asked her how she had become so successful so quickly. Madison shrugged it off with a "Just lucky, I guess," but later that evening she thought more about it. Why was she getting good results? She had always had a good sense of people and that was clearly an important skill. But many other people in her department had good people skills too. She thought about colleagues at other companies who did the same kind of work. When she looked closely, she started to realize that a part of her advantage might come from her use of information technology.

She noticed that many people in her department were more people-oriented and did not favour using computer applications. They weren't used to creating spreadsheets and analyzing data they found on the web. Some people did not understand how much information about potential employees was available on the web. They shied away from posting jobs on Internet job sites such as Monster (www.monster.ca), saying, "It's too complicated" or "You get way too many responses. We can't handle that." Madison recognized that she had learned quite a bit at university about how to handle

¹ See Huselid, Mark A, "The Impact of Human Resource Management Practices on Turnover, Productivity, and Corporate Financial Performance," *The Academy of Management Journal* 38, no. 3 (June 1995): 635-672.











information technology and how to make it work for her. For example, she used her experience with social networking sites such as Twitter, Facebook, and MySpace to full advantage: She googled all her candidates and checked out their web presence before every interview. Information technology was a big part of her daily work.

Madison did not consider herself a computer geek. She was focused on people. What she *had* learned was how to keep her eyes open for opportunities to improve the way she worked. She found that information technology can often provide opportunities to do things faster and more effectively. Even in a department like human resources, it was clear she had used information technology to gain a competitive advantage.



Study Questions

-  1 What is the productivity paradox?
-  2 Can information systems improve productivity?
-  3 How are organizational strategy and industry structure related?
-  4 What is the relationship between innovation and information technology?
-  5 How do information systems provide competitive advantage?
-  6 Can competitive advantage through information systems be sustained?

Q I What Is the Productivity Paradox?

Computers are literally everywhere in our society. Watches, phones, MP3 players, cameras, calculators, televisions, cash registers, automobiles, and even some greeting cards have embedded computing technology. It is hard to think of a world without computers. It is even harder, perhaps, to argue that computers have had no impact on the economic productivity of our economy. But in 1989, that is precisely what economist Stephen Roach reported.²

It was not his intention to downgrade the importance of information technology. Instead, what Roach reported was that he found no evidence of an increase in worker productivity associated with the massive increase in investment in information technology. This result, along with other similar studies, led the Nobel Prize-winning economist Robert Solow to make the now-famous statement, “We see computers everywhere except in the productivity statistics.” The **productivity paradox** was born. While this issue is more than 20 years old, the question of how IT adds to **productivity**—that is, how IT can be used to create business value—remains important. Today, we are interested in how investments in information technology can create **business value**—that is, tangible benefits for organizations through either more efficient use of resources or more effective delivery of their services to customers.

Perhaps the most interesting fact about the productivity paradox is that it was never really viewed as a paradox for most organizations. Despite widespread publication of the paradox, developed economies continued to pour investment dollars into information technology. While economists and other researchers were looking for productivity in the statistics, businesses were busy making huge investments in computing technology. The majority of businesses seemed to be able to justify large investments in IT. The important question we are considering in this chapter is whether these businesses were receiving value from their investments.

Over time it has been recognized that measurement error may be a critical reason for the observed lack of productivity from IT investments.³ The difficulty in measuring productivity in an increasingly service-based economy has made it challenging to find productivity increases from IT. This mismeasurement is in part due to the often invisible or intangible benefits associated with information technology. (For example, could you complete your latest essay assignment without a computer? You could use a typewriter. You still have to type the words, so there is little typing saved. What does a computer add to this process? Does the computer make you more productive? How much time does it save?) We will return to the issue of intangible benefits later in this chapter.

One response to the productivity paradox was a careful consideration of the value that can be derived from IT investment.⁴ Researchers suggested that there were three different ways through which the value of IT can be realized. The first is through productivity. Information technology allows a company to make either more output from the same inputs, and/or to make better output,

² Roach, S. S., “America’s White-Collar Productivity Dilemma,” *Manufacturing Engineering* (August 1989): 104.

³ See Brynjolfsson, E., “The Productivity Paradox of Information Technology: Review and Assessment,” *Communications of the ACM* 36, no. 12 (December 1993): 67–77; and King, John L., “IT Responsible for Most Productivity Gains,” *Computing Research News* 15, no. 4 (September 2003): 1–6, www.cra.org/CRN/articles/sept03/king.html (accessed March 21, 2007).

⁴ Hitt, L. and E. Brynjolfsson, “Productivity, Profit and Consumer Welfare: Three Different Measures of Information Technology’s Value,” *MIS Quarterly* 20, no. 2 (June 1996): 121–142.

and/or to make the output faster than before the technology was in place. For example, if you had a small accounting firm, investing in information technology might allow you to add more customers, to automate basic tasks (like completing tax forms), and to provide more up-to-date information for clients. This investment makes the firm more efficient and potentially more effective.

The second way in which IT value is realized is through the structure of competition. Information technology can alter the way corporations compete. For example, when one accounting firm invests in information technology, it is often the case that other rival firms will follow suit to keep up with the competition. The accounting firms now compete on the software they offer and the technical support they can provide. The competitive structure changes because of information technology. Another example is the video rental industry. When information technology enables people to rent movies by clicking a few buttons on their computer screen at home, instead of getting in the car and driving to the video-rental store, the industry changes, because the technology has changed the structure of competition.

The final way that IT investment value is realized is through benefits to the end customer. Information technology helps make processes more efficient and changes the nature of competition. With increased competition, the reduction of costs associated with new processes is often transferred to the final consumer. The consumer may therefore see cheaper and better goods and services as a result of information technology. For example, competing accounting firms might offer their clients more services and perhaps even lower prices on services after investing in information technology. The consumer often reaps the benefit of higher investment in information technology.

Some controversy remains in regard to how productive information technology investments are. In today's world, organizations cannot afford to invest in information technology simply because "everybody else is doing it," and then hope for the best. We call that strategy "technology for technology's sake" and it simply doesn't work. Successful organizations need to understand specifically what business value they are seeking and how information technology can help secure that value. Doing this consistently and successfully takes knowledge of both information technology and business. It is for this reason that organizations value people who are able to understand both technology and business. We will look more carefully in the remaining sections of this chapter at how information systems affect productivity, industry structure, and organizational strategy.

2 Can Information Systems Improve Productivity?

We saw in Chapter 2 that companies organize work through business processes. Business processes use resources, facilities, and information to accomplish activities. Business processes are therefore an important consideration in productivity. Productivity for organizations can be increased either through increased efficiency or effective business processes.

Increasing **efficiency** means that business processes can be accomplished either more quickly or with fewer resources and facilities (or both). Efficiency is usually relatively easy to measure. When organizations focus on efficiency they are working toward "doing things right." Doing things right often means using just the right amount of resources, facilities, and information to complete the job satisfactorily.

When companies focus on increasing **effectiveness**, rather than efficiency, they are interested in “doing the right things.” Increased effectiveness means that the company considers offering either new or improved goods or services that the customer values. Doing the right things often requires companies to consider changing their business processes to deliver something new and improved.

Sometimes, “doing the right things” and “doing things right” can be in conflict in a company. For example, Company A could be so focused on increasing efficiency that it misses the fact that customers have changed and no longer value Company A’s product. Company A might be doing things right, but it is not doing the right things. In another example, Company B might be so focused on changing its product to perfectly suit its customers that it does not spend enough time thinking about how efficient its processes are. In other words, Company B might not be doing things right. Company B might operate inefficiently and would be at a disadvantage relative to other firms that are more efficient. While we might argue about whether “doing things right” or “doing the right things” is more important, it is clear that companies with long-term success in mind understand the important balance between effectiveness and efficiency.

Business Processes and Value Chains

Business processes are closely related to the concept of a value chain. A **value chain** is a network of activities that improve the effectiveness (or value) of a good or service. A value chain is therefore made up of at least one and often many business processes.

Let’s look at a specific example. A customer in Canada does not see much value in a large blob of natural rubber harvested at a rubber plant farm in Vietnam. What would you pay for something like this? Likely not much. But when a tire manufacturing company ships that blob of rubber to a factory and has engineers design a high-performance, all-season radial tire, and then sends the blob of rubber through the various processes required to make the tire, the blob of rubber has gained some value. How much would you pay for the tire now? Even more value is gained when the tire is shipped to a tire store close to the customer, and more still is created when a mechanic at the store installs the tire. Each of these steps in the chain—each of these business processes—adds some value, as shown in Figure 3-1. This is why we refer to this chain of events as a value chain. Organizations that expand into activities that affect raw materials—such as a tire company that begins to manufacture its own rubber or a coffee store that begins to grow its own coffee—are said to be undertaking backward integration or to be moving upstream on the value chain. Those that move closer to end customers—for example, a mining company that begins to cut and finish its own diamonds rather than wholesale raw stones—would be undertaking forward integration, or moving downstream on the value chain.

In general, the more value a company adds to a good or service in its value chain, the higher the price the company can charge for the final product. The difference between the price the customer is willing to pay and the cost the company incurs in moving the goods or services through the value chain is defined as the **margin**. Raw diamonds, for example, are sold at a much lower margin than finished diamonds. The greater the margin, the greater the profit (per unit) for the company.

The concept of a value chain was formalized by Michael Porter, a professor at Harvard University. He identified two types of activities that support value chains. **Primary activities** are activities in which value is added directly to the

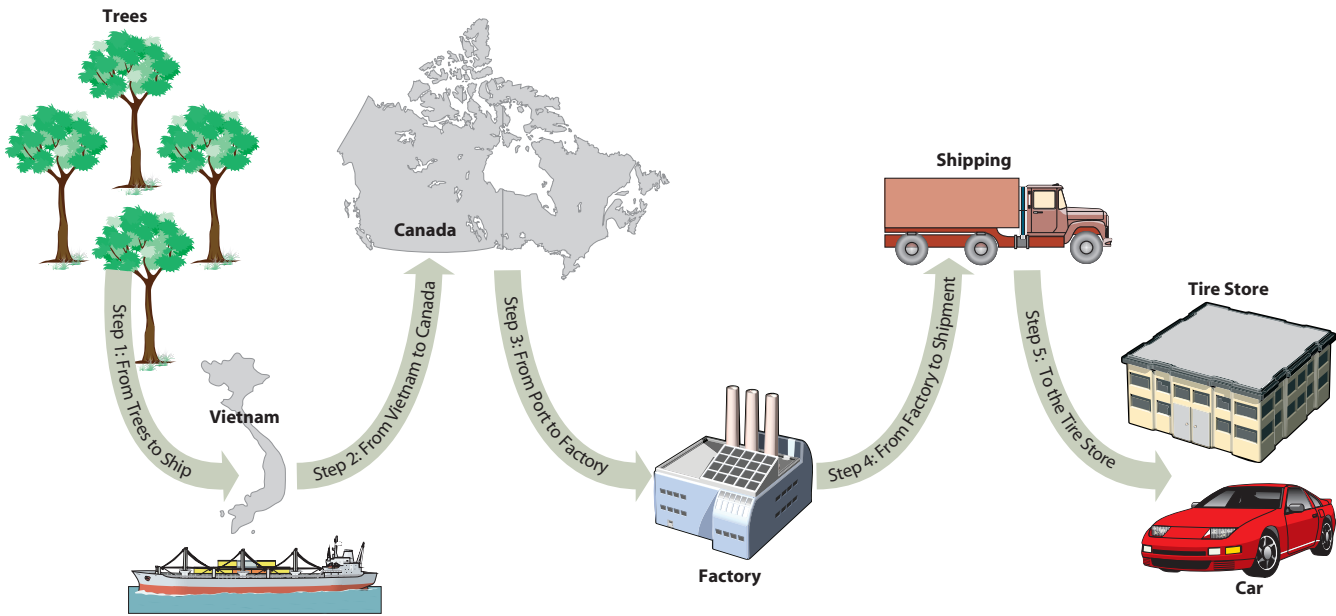


Figure 3-1
Business Process

product. In our example above, shipping raw materials, designing the tires, manufacturing the tires, shipping the finished tires, and installing the tires are all primary activities. Each of these primary activities adds value for the customer.

But there are a whole range of activities in companies that do not add value directly to the product. For instance, who pays the workers in the factory? Who bought the machines at the factory that makes the tires? Who maintains the machines inside the factory and keeps the lights on and the heat working? Who schedules the shipping of the finished tires? Who keeps track of the mechanics' hours? These activities, and many more, are referred to as **support activities**, because they support the primary activities.

Support activities add value only indirectly. For example, nobody buys a tire because a company has a great payroll system. But a company could not run a factory without a payroll system. A great payroll system might make the company more efficient and allow the company to offer a lower price than competitors. The benefit of the payroll system may not directly add to the value as seen by the customer, but these support activities are critical to the success of the organization. Figures 3-2 and 3-3 summarize the concepts we have just discussed. You can use "MIS in Use" to further develop your ideas about the value chain.

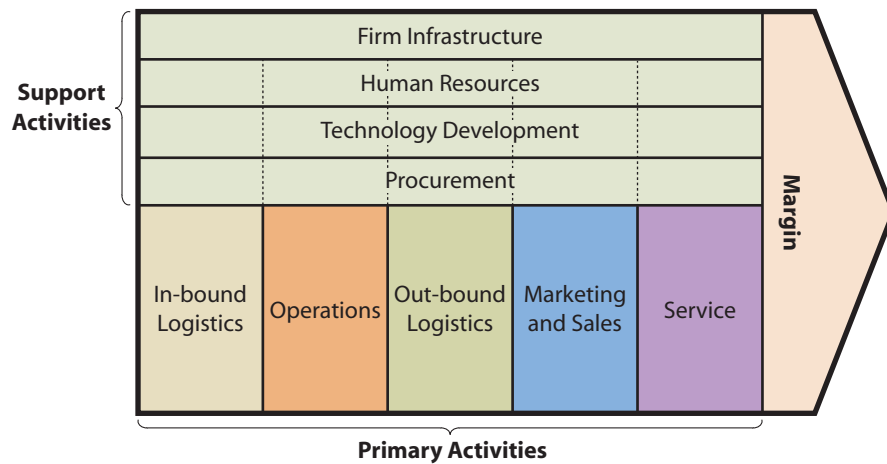


Figure 3-2
Porter's Value Chain Model

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Winterborne Bicycles: Building the Biking Experience

Winterborne Custom Bicycles (www.winterbornebikes.com) was founded in 2001 by Jason Filer in picturesque Guelph, Ontario. Winterborne is a small company whose typical customer is a cycling enthusiast—a serious rider who knows a lot about bicycles and is ready to move up to a high-quality, custom-designed, hand-built bicycle.

The main parts of a custom bike are the frame and the wheels, and the company offers a number of choices in each type, style, and price range. Extensive bike-fitting sessions are part of the design process. The customer can also specify the paint finish and component set that completes the bike build.

In conjunction with a local college, Winterborne has also begun to offer intensive bicycle-maintenance courses, so that customers and current and aspiring bicycle mechanics can gain practical knowledge and experience with all major bicycle components, including frames, bearings, wheels, drive trains, brakes, and shifting systems, on a variety of bicycle styles and vintages.

Many customers come to the shop looking to purchase a custom bike or wheels, or to upgrade pieces for their current bike such as forks, suspension, handlebars, pedals, gearing, shifting, brakes, saddles, and seatposts. The company offers a number of brands in a wide range of styles and sizes.

Filer and his business partner, retired information systems executive Alan Medcalf, both consider Winterborne more of a vocation than a business, and they help customers make the best possible choices for their cycling wants and needs. Both Filer and Medcalf are well-trained technicians who set up each bike and offer services such as customization and bike repairs. Customers also relied on them for recommendations on a wide range of biking accessories, such as helmets, riding gear, lighting, gloves, and shoes.

The company's website provides customers with information about products, and promotes events such as weekend maintenance clinics, the advanced maintenance course, group rides and clubs, trail-maintenance days, and educational seminars.

Understanding the value chain helps us understand how information systems can increase productivity. One way they do this is by enabling the development of more efficient or more effective supporting activities. These systems include applications such as financial accounting systems, human resources systems, production systems, and customer relationship management systems.

Figure 3-3
Task Descriptions for Primary
Activities of the Value Chain
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Group, from *Competitive Advantage:
Creating and Sustaining Superior
Performance* by Michael E. Porter.
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Primary Activity	Description
In-bound logistics	Receiving, storing, and disseminating inputs to the product
Operations	Transforming inputs into the final product
Out-bound logistics	Collecting, storing, and physically distributing the product to buyers
Marketing and sales	Inducing buyers to purchase the product and providing a means for them to do so
Service	Assisting customer's use of the product and thus maintaining and enhancing the product's value



Figure 3-4
Winterborne Custom Bicycles

Source: Courtesy of Winterborne Bicycle Institute

Questions

1. Identify the value chain involved in obtaining a new bicycle from Winterborne Custom Bicycles. Can you identify the primary activities that create value for the customer when purchasing a new bike?
2. What information systems do you think could be used to support these primary activities?
3. Check out the company's website (www.winterbornebikes.com). Does the site fill the role of a primary activity or is it more appropriately considered a support activity? Justify your answer.

Increasing the efficiency and effectiveness of these support systems increases the margin enjoyed by the company.

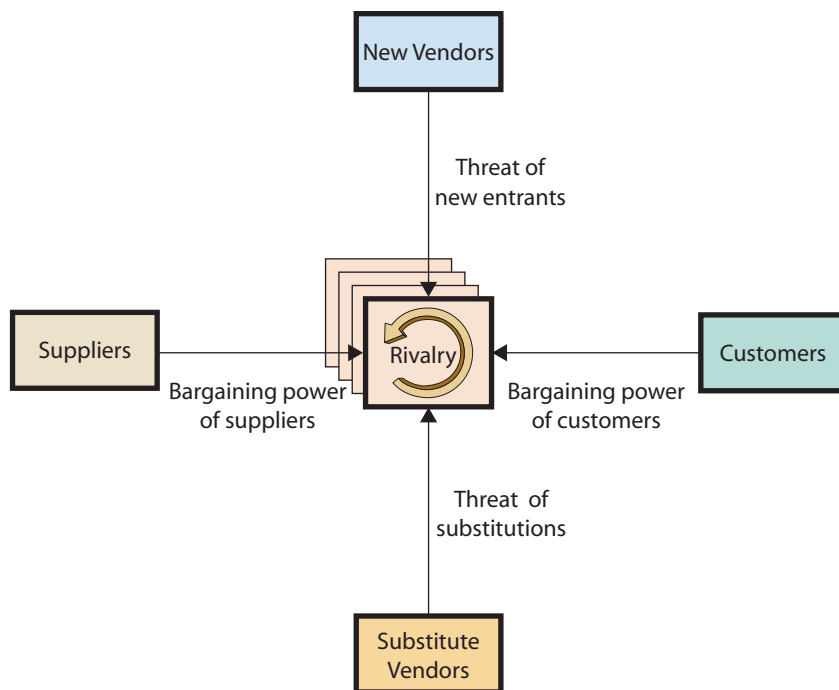
Information systems also increase productivity by offering new and improved services, primary activities that would not be available without information technology. These might include customer shopping through the web, 24-hour customer support through online discussion boards and frequently asked questions, online package tracking for the courier business, and airline ticket and hotel reservations through the web. Providing these new or improved services adds value for the customer and can contribute to the company's margin and their ability to compete.

Q3 How Are Organizational Strategy and Industry Structure Related?

You will learn in your strategy class that an organization's strategy reflects its goals and objectives. A company's strategy is influenced by the competitive structure of the company's industry. In theory, a company's information systems

Figure 3-5
Porter's Model of
Industry Structure

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strategy should support, or be aligned with, the overall company strategy. In the real world, it is possible for the organizational strategy and information systems strategy to be somewhat out of alignment. We will address this alignment in Chapters 7 and 9.

Organizational strategy begins with an assessment of the fundamental characteristics and structure of an industry. One model used to assess an industry structure is Porter's **five forces model**,⁵ shown in Figure 3-5. According to this model, five competitive forces determine industry profitability: bargaining power of customers, threat of substitutions, bargaining power of suppliers, threat of new entrants, and rivalry among existing firms. The intensity of each of the five forces determines the characteristics of the industry, how profitable it is, and how sustainable that profitability will be.

To understand this model, consider a particular industry—the soft drink industry. Let's look at each of the forces, beginning with the bargaining power of the customers. Customers can switch pretty easily between competing soft drinks. So the companies within the industry have to be ready to please the customer, because the customer's tastes and desires are important forces. The threat of customers turning to substitutes, such as water (bottled or not), juice, or caffeine-laden energy drinks is ever-present, so the soft drink companies must constantly respond to it, in part by expanding their product offerings to include these choices.

Companies within this industry also have significant amounts of power over their suppliers because a contract with Coca-Cola or PepsiCo can often be very lucrative. Thus, the soft drink companies get very competitive prices for their ingredients. New entrants to the soft drink industry have a hard time because they are unable to obtain the same kinds of terms from their suppliers and so their costs are higher, which places them at a disadvantage. As well, the large firms that dominate the industry have made huge investments in the distribution network, so a new small firm will have a hard time gaining access to the stores and restaurants that sell established brands. Fighting that fight is a

⁵ Porter, M. *Competitive Strategy: Techniques for Analyzing Industries and Competitors* (New York: Free Press, 1980).

		Cost	Differentiation
Industry-wide		Lowest cost across the industry	Better product/service across the industry
	Focus	Lowest cost within an industry segment	Better product/service within an industry segment

Figure 3-6
Porter's Four Competitive Strategies

real uphill battle, so many companies that would try to compete instead choose not to. Finally, the competition within the industry—remember the Pepsi Challenge?—is very intense. What is interesting is that the firms very rarely compete on price. Instead, they spend massive amounts of money on marketing their brand.

So what does all of this mean? To make a profit in the soft drink industry, it helps if you are a large company that has access to the lowest-priced ingredients, an established network of distributors, and expertise in brand development and responding to changing consumer desires. The nature of the competitive forces in the soft drink industry suggests a certain competitive structure. Other industries will have different structures, because the competitive forces are different in each industry.

To be successful, organizations examine these five forces and determine how they intend to respond to them. That examination leads to what is referred to as an organization's competitive strategy.

An organization responds to the structure of its industry by choosing a **competitive strategy**. Porter followed his five forces model with the model of four competitive strategies shown in Figure 3-6.⁶ According to Porter, a firm can engage in one of these four fundamental competitive strategies. An organization can focus on being the cost leader or it can focus on differentiating its products from those of the competition. Further, the organization can employ the cost or differentiation strategy across an industry, or it can focus its strategy on a particular industry segment.

Consider the car rental industry, for example. According to the first column of Figure 3-6, a car rental company can strive to provide the lowest-cost car rentals across the industry, or it can seek to provide the lowest-cost car rentals to an industry segment—say, domestic business travellers.

As shown in the second column, a car rental company can seek to differentiate its products from the competition. It can do so in various ways—for example, by providing a wide range of high-quality cars, by providing the best reservations system, by having the cleanest cars or the fastest check-in, or even by picking up its customers. The company can strive to provide product differentiation across the industry or within particular segments of the industry, such as domestic business travellers.

According to Porter, to be effective, the organization's goals, objectives, culture, and activities must be consistent with the organization's strategy. To those in the MIS field, this means that all information systems in the organization must facilitate and be aligned with the organization's competitive strategy. We will discuss the concept of alignment further in Chapter 9.

⁶ Porter, M. *Competitive Strategy* (New York: Free Press, 1985).

Q4 What Is the Relationship between Innovation and Information Technology?

Changes to industry structure often occur through innovation. Over the last 100 years, technology has enabled much of the innovation we have seen in our economy. This technological innovation is all around us today. One hundred years ago there was little electrical power. There were few telephones. Automobiles were just beginning to be produced. The world had just witnessed the first powered flight. Radio was still being developed and television was just a dream. Now we take these innovations for granted and wonder how people lived without them.

When considering technological innovation, Bower and Christensen⁷ suggested that there are two general types of technology innovations. **Sustaining technologies** are changes in technology that maintain the rate of improvement in customer value. For example, the vulcanization of rubber allowed tire manufacturers to produce tires that rode more quickly and comfortably. This innovation improved the experience of driving a car and helped sustain the original innovation.

In contrast, **disruptive technologies** introduce a very new package of attributes to the accepted mainstream products. For example, in the music industry, the advent of MP3 was a disruptive technology because it offered the ability to store and play music through digital devices. People moved from buying CDs and tapes to listen to in their Sony Walkmans to downloading MP3s and listening to music through their Apple iPods.

Information technology has been an important part of technological innovations since the 1950s. From the first electronic computer in 1939 to the first personal computer in 1980 and the commercialization of the Internet in the early 1990s, the rate of innovation in information technology has been staggering. In some instances, information technology acts as a sustaining technology. Improved size and speed of memory helps us store and retrieve data more quickly. Faster processors help the computer accomplish more in the same amount of time. Sustaining technologies help make processes more efficient (and often more effective), and hence create value for organizations.

In other cases, information technology acts as a disruptive technology. For example, when RBC Royal Bank first offered a national automated banking machine network in Canada in 1980,⁸ it presented customers with new choices. The other chartered banks in Canada quickly responded with machines of their own. Similarly, when the Canadian company Research In Motion, which operates out of Waterloo, Ontario, launched the first BlackBerry in 1999, it provided worldwide customers with new communication options. Wireless companies around the globe had to respond to these new sets of choices.

Both of these companies gained competitive advantage by employing information technology. When a company gains competitive advantage using a disruptive technology, there is the potential to alter the structure of an industry. Competing companies must react to the new conditions or risk losing margin and customers. Both large and small companies within the industry must react to these changes. You can learn more about how small companies react to a disruptive technology by reading Case Study 3, about ICS Courier, at the end of this chapter.

In some cases, the competitive advantage is so large that it leads to a new industry. Such was the case for the microcomputer. Its advent led to the

⁷ Bower, J. and C. Christensen, "Disruptive Technologies: Catching the Wave," *Harvard Business Review* 73, no. 1 (Jan/Feb 1995): 43–53.

⁸ See www.rbc.com/history/anytimeanywhere/self_service-detail.html#2.

development of the microcomputer industry and the creation of new companies such as Microsoft, Intel, Apple, Oracle, and Dell. Amazon, eBay, and Google were born out of the commercialization of the Internet. Wireless network technology innovation led to the development of such Canadian companies as Waterloo's Research In Motion (www.rim.com) and Sierra Wireless (www.sierrawireless.com), based in Richmond, British Columbia. More recently, innovations in networking services have created new industries in social networking and messaging, as evidenced by Facebook, MySpace, and Twitter.

One of the more important considerations when thinking about innovation is how quickly the innovation “catches on” in society, or diffuses through it. The theory of the **diffusion of innovation** was defined by Everett Rogers as “the process by which an innovation is communicated through certain channels over time among the members of a social system.”⁹ In his book, Rogers identified five stages through which the diffusion of an innovation occurs. The stages, or steps in the process, are knowledge, persuasion, decision, implementation, and confirmation, as shown in Figure 3-7. Since many innovations are not adopted, an individual or organization thinking about adoption does not necessarily have to go through all of these steps. It can drop the process at any point.

In Rogers's theory of the diffusion of innovation, the knowledge stage occurs when an individual first hears about an innovation but lacks specific information about it. For example, you may have heard about the iPhone, but you may not know much about it. The next stage is persuasion, when the individual becomes interested in the innovation and finds out more about it. Once enough information is collected, you move into the decision stage. Here, the individual considers the pros and cons of adopting the innovation, and a decision is made whether to adopt or to reject it. If the individual decides to pursue the innovation, the implementation stage is reached. In implementation the individual uses the innovation and figures out whether to continue using it or look for an even better way. If the individual is happy, then he or she reaches the peaceful state of confirmation, where the individual uses the innovation to its full potential.

The theory of diffusion of innovation provides us with a way of thinking about the process of adoption of new technology. In Chapter 10 we will return to the concept of diffusion of innovation when we discuss why organizations invest in information technology and what characteristics of the innovation are important to decision makers.

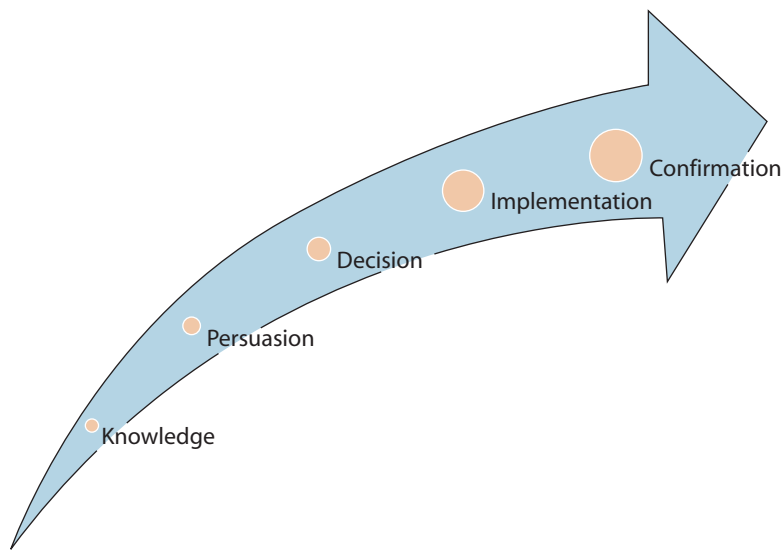


Figure 3-7
Roger's Theory of Diffusion
of Innovation

⁹ Rogers, Everett M. *Diffusion of Innovations* (Glencoe: Free Press, 1964), p. 79.

Q5 How Do Information Systems Provide Competitive Advantage?

If you take a business strategy class you will study the Porter models in greater detail than we have discussed here. When you do so, you will learn numerous ways that organizations respond to the five competitive forces. For our purposes, we can distill those ways into the list of principles shown in Figure 3-8. Keep in mind that we are applying these principles in the context of the organization's competitive strategy. (You can also apply these principles to a personal competitive advantage, as discussed in the Exercise "The Digital Divide" at the end of this chapter.)

Some of these competitive techniques are created via products and services, and some are created via the development of business processes. Consider each.

Competitive Advantage via Products

The first three principles in Figure 3-8 concern products or services. Organizations gain a competitive advantage by creating new products or services, by enhancing existing products or services, and by differentiating their products and services from those of their competitors. As you think about these three principles, realize that an information system can be part of a product or it can provide support for a product or service. "MIS in Use," on page 64, discusses how a company that builds bikes uses the Internet to provide additional services to the customer. This adds value to customer interactions with the company.

Consider, for example, a car rental agency like Hertz or Avis. An information system that produces information about the car's location and provides driving instructions to help drivers get wherever they're going is part of the car rental package and thus is part of the product itself. In contrast, an information system that schedules car maintenance is not part of the product but instead supports the product. Either way, information systems can achieve the first three objectives listed in Figure 3-8.

The remaining five principles listed in Figure 3-8 concern the competitive advantage created by the implementation of business processes.

Competitive Advantage via Business Processes

Organizations can lock in customers by making it difficult or expensive for them to switch to another product. This strategy is sometimes called **switching costs**. Organizations can lock in suppliers by making it difficult to switch to another organization, or, stated positively, by making it easy for them to connect to and work with the organization. Finally, competitive advantage can be gained by

Figure 3-8
Principles of Competitive
Advantage

Product Implementations

1. Create a new product or service
2. Enhance products or services
3. Differentiate products or services

System Implementations

4. Lock in customers and buyers
5. Lock in suppliers
6. Raise barriers to market entry
7. Establish alliances
8. Reduce costs

creating entry barriers that make it difficult and expensive for new competition to enter the market.

Another way to gain competitive advantage is to establish alliances with other organizations. Such alliances create standards, promote product awareness and needs, develop market size, reduce purchasing costs, and provide other benefits. Finally, organizations can gain competitive advantage by reducing costs. Such reductions enable the organization to reduce prices and/or increase profitability. Increased profitability means not just greater shareholder value, but also more cash, which can fund further infrastructure development for even greater competitive advantage.

Q6 Can Competitive Advantage through Information Systems Be Sustained?

We have noted that information technology can provide a competitive advantage for companies. But can these advantages be sustained? Competitors often react to innovations by replicating the technology. Since the effect of information technology can often be readily seen, it may be hard to hide the innovation. Technology and software can be purchased or developed. It is therefore almost impossible to keep competitors from developing competing technology.

The banks that produced the first automated banking machines were quickly copied by competitors. While patents can provide some protection for technologies (such as the BlackBerry), patents are difficult and expensive to enforce, and they are not permanent. Does this mean that all information technology innovations are doomed to be temporary?

In his *Harvard Business Review* article “IT Doesn’t Matter,”¹⁰ Nicholas Carr suggested that the evolution of information technology in business follows a pattern similar to earlier disruptive technologies like railroads and electric power. As these disruptive technologies are being developed, the technologies open opportunities for companies to gain strong competitive advantages. But as the availability of the technologies increases, and their cost decreases, these technologies become more like commodities. From a strategic standpoint, the technologies become invisible and no longer provide advantages. In other words, the more ubiquitous—existing everywhere—information technology becomes, the less competitive advantage information technology provides.

We have noted above that this is true to a certain degree. But it is important to understand clearly what we are talking about. If we are talking about information technology (hardware, software, and networks), then what Carr has said is largely true. Hardware and software have become readily accessible to almost all companies and, while not entirely a commodity, they have largely become commoditized.

However, if we consider information systems (which also include procedures and people along with hardware and software), then what Carr notes is less convincing. The same information technology installed into different organizations might result in very different outcomes. While the machines and software may be a commodity, organizational procedures and the people in organizations are not standardized. Some companies (and some people) might be able to quickly adapt to new technology. Other companies (or people) might be less willing or able to do so.

¹⁰ Carr, N. “IT Doesn’t Matter,” *Harvard Business Review* 81, no. 5 (May 2003): 41–49.

It is important to recognize that long-term competitive advantage lies not with the technology but rather in how the company and people adopt the technology. If you learn one thing from this chapter, it should be that when it comes to information technology, people make all the difference. So while IT may not matter, information systems certainly do.

So how should we understand **sustained competitive advantage**? It requires companies to find a distinctive way to compete. This way of competing will change over time. The emphasis should be placed on developing increasingly sophisticated integration between information technology and the people and procedures in the organization. Companies with sustainable competitive advantage work to integrate many activities: their marketing, customer service, product design, and product delivery. When a company successfully integrates many technology systems with its people and procedures, competitors have to match the whole system. While competitors might be able to purchase the technology component, it takes time for people to gain the necessary experience and skill to really make the technology work for the organization. Matching the entire set of information systems can be a steep hill to climb for companies that have less experience and success in integrating people and technology. So sustained competitive advantage comes from developing people and procedures that are well supported by the underlying technology.

Active Review

Use this Active Review to verify that you understand the material in the chapter. You can read the entire chapter and then perform the tasks in this review, or you can read the material for just one question and perform the tasks for that question before moving on to the next one.

1 What is the productivity paradox?

Explain what is meant by the productivity paradox. Can you explain how using a computer makes you more productive than simply using a typewriter? List three ways in which information systems can create value.

2 Can information systems improve productivity?

Explain the relationship between business processes and value chains. What are the differences between primary and support activities? How does information technology affect value chains?

3 How are organizational strategy and industry structure related?

Name and briefly describe the five forces. Can you analyze an industry based on the strengths of the different forces? What are the four main types of competitive strategy as identified by Porter?

4 What is the relationship between innovation and information technology?

Explain the differences between sustaining and disruptive technologies. Provide examples in which information technology is a sustaining technology, and in which information technology is a disruptive technology. What is meant by the diffusion of innovation? Describe the steps in the process of diffusion of innovation.

5 How do information systems provide competitive advantage?

List and briefly describe eight principles of competitive advantage. Consider the bookstore at your school, for example. List one application of information technology that takes advantage of each of these principles.

6 Can competitive advantage through information systems be sustained?

Describe what is meant by sustained competitive advantage. Explain why information technology does not generally provide sustained competitive advantage. Explain why information systems can provide sustained competitive advantage.

Key Terms and Concepts

Business value	60	Five forces model	66	Sustained competitive advantage	72
Competitive strategy	67	Margin	62	Sustaining technologies	68
Diffusion of innovation	69	Primary activities	62	Switching costs	70
Disruptive technology	68	Productivity	60	Value chain	62
Effectiveness	62	Productivity paradox	60		
Efficiency	61	Support activities	63		

Using Your Knowledge

- Apply the value chain model to a retailer such as Target (www.target.com). What is its competitive strategy? Describe the tasks Target must accomplish for each of the primary value-chain activities. How does Target's competitive strategy and the nature of its business influence the general characteristics of Target's information systems?
- Apply the value chain model to a mail-order company such as L.L.Bean (www.llbean.com). What is its competitive strategy? Describe the tasks L.L.Bean must accomplish for each of the primary value chain activities. How does L.L.Bean's competitive strategy and the nature of its business influence the general characteristics of its information systems?
- Suppose you decide to start a business that recruits students for summer jobs. You will match available students with available jobs. You need to learn what positions are available and what students are available for filling those positions. In starting your business, you know you will be competing with local newspapers, craigslist (www.craigslist.org), and your college or university. You will probably have other local competitors as well.
 - Analyze the structure of this industry according to Porter's five forces model.
 - Given your analysis in (a), recommend a competitive strategy.
 - Describe the primary value chain activities as they apply to this business.
 - Describe a business process for recruiting students.
 - Describe information systems that could be used to support the business process in (d).
 - Explain how the process you describe in (d) and the system you describe in (e) reflect your competitive strategy.
- Samantha Green owns and operates Twigs Tree Trimming Service. Samantha graduated from the forestry program of a nearby university and worked for a large landscape design firm, doing tree trimming and removal. After several years at the company, she bought a truck, stump grinder, and other equipment, and opened her own business in Winnipeg.

Although many of her contracts are one-time operations, to remove a tree or stump, others are recurring, such as trimming a tree or groups of trees every year or every other year. When business is slow, she calls former clients to remind them of her services and of the need to trim their trees on a regular basis.

Samantha has never heard of Michael Porter or his theories. She operates her business "by the seat of her pants."

- a. Explain how an analysis of the five competitive forces could help Samantha.
 - b. Do you think Samantha has a competitive strategy? What competitive strategy would seem to make sense for her?
 - c. How would knowledge of her competitive strategy help her sales and marketing efforts?
 - d. Describe, in general terms, the kind of information system Samantha needs in order to support sales and marketing efforts.
5. FiredUp Inc. is a small business owned by Curt and Julie Robards. Based in Brisbane, Australia, FiredUp manufactures and sells a lightweight camping stove called the FiredNow. Curt, who previously worked as an aerospace engineer, invented and patented a burning nozzle that enables the stove to stay lit in very high winds—up to 140 kilometres per hour. Julie, an industrial designer by training, developed an elegant folding design that is small, lightweight, easy to set up, and very stable. Curt and Julie manufacture the stove in their garage, and they sell it directly to their customers over the Internet and on the phone.
- a. Explain how an analysis of the five competitive forces could help FiredUp.
 - b. What does FiredUp's competitive strategy seem to be?
 - c. Briefly summarize how the primary value chain activities pertain to FiredUp. How should the company design these value chains to conform to its competitive strategy?
 - d. Describe business processes that FiredUp needs in order to implement its marketing and sales and also its service value chain activities.
 - e. Describe, in general terms, information systems to support your answer to question (d).

Collaborative Exercises

The High-Value Bike Rental Company rents bikes to business executives at conference resorts. A well-dressed rental agent greets each potential customer and has a discussion to determine his or her biking needs. When the customer is ready to rent a bike, the agent enters his or her information into the customer database and checks to see if a bike is available in the bike inventory database. When the customer returns the bike, he or she pays for the rental by providing their hotel room number. The bike is then cleaned and put back into the bike inventory database. This triggers an update to the database, which then bills the customer for the rental. A charge is sent from the database to the hotel billing system. Figure 3-9 shows the rental process and related information systems for the High-Value Bike Rental Company. Using this information, collaborate with your team to answer the following questions:

1. Explain the relationship of value and cost according to the Porter value chain model. When does it make sense to add cost to a business process?
2. Suppose you are told that the business process in Figure 3-9 has a negative margin. Explain what that means. Suppose the margin of some business process is a negative \$1 million. If costs are reduced by \$1.2 million, will the margin necessarily be positive? Explain why or why not.

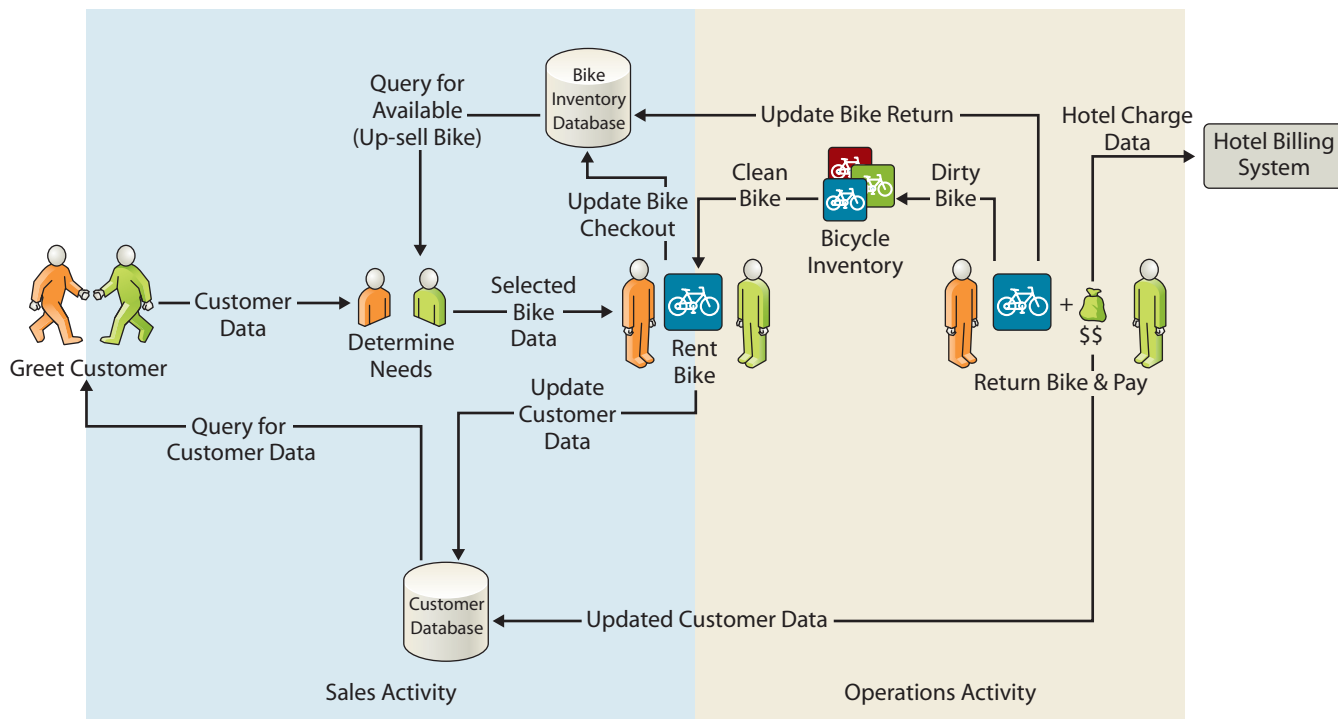


Figure 3-9
Rental Process for High-Value
Bike Rental

3. Consider the alternative of replacing the rental agent from the business process in Figure 3-9.
 - a. Describe changes that will need to be made to the process documented in Figure 3-9.
 - b. Would eliminating the rental agent change the competitive strategy of this company? Is it possible to be a high-value company with no rental personnel? Explain why or why not.
 - c. Would eliminating the rental agent necessarily reduce costs? What costs would increase as a result of this change?

4. Consider the alternative of increasing the value delivered by the existing rental agent—for example, renting more kinds of equipment or selling items of use to guests who are renting bicycles. Consider other options as well.
 - a. Describe four ways that you think the existing personnel could increase the value of this business process.
 - b. For the four alternatives you developed in part (a), name and describe criteria for selecting among them.
 - c. Using the criteria developed in part (b), evaluate the alternative you identified in part (a) and select the best one. Explain your selection.
 - d. Redraw Figure 3-9, using the alternative you selected in part (c).

Case Study 3

ICS Courier: Keeping Up with the Joneses

What happens to smaller companies when larger companies in the same industry invest heavily in information systems? How can smaller firms expect to “keep up with the Joneses”? A good example is provided by the courier industry. In Canada, this industry is large and competitive. It distributes more than 2.1 million packages every day, and has an estimated annual revenue of \$4.7 billion.¹¹ FedEx gained a competitive advantage in 1994 when the company enabled customers to view the status of their packages using the Internet. Dominant firms in the industry, such as Purolator Courier, DHL Courier, UPS, and Canada Post, responded to FedEx’s move by providing customer access to their own tracking systems. Barcoded packages, handheld scanners, and a complex network of information systems enabled these large companies to provide package status to customers in a timely fashion.

But how could smaller courier companies respond to this technology investment? Smaller companies do not usually have the ability to pay for large and complex information systems. ICS Courier (www.ics-canada.net; see Figure 3-10), for example, is a relatively small courier business, with annual revenues of \$100 million. The company, headquartered in Toronto, was established in 1978, operates 35 offices, and employs approximately 1000 people.

ICS Courier did not have the resources in place in 1994 to provide customers with access to package tracking. How could it survive? ICS recognized that, as a smaller company, it could specialize its services. The company began focusing on business-to-business courier services. ICS made sure that its drivers stopped at the same locations and at the same time each day. This personalized service allowed ICS drivers to be the most knowledgeable in the industry: They became experts in the industries they served. The service consistency and

Figure 3-10
The ICS Courier Company Profile

The screenshot shows the ICS Courier website. The header features the ICS Courier logo and the tagline "The Courier for Canada's Overnight Deliveries". Below the header is a navigation menu with tabs for COMPANY INFO, PRODUCT INFO, NEW CUSTOMER, RATES, and CUSTOMER SERVICE. Under COMPANY INFO, there are links for COMPANY PROFILE, MISSION STATEMENT, and EMPLOYMENT OPPORTUNITIES. Other navigation links include ICS BRANCHES, POINTS OF SERVICE, LINKS, SITE MAP, and HOME. The main content area is titled "COMPANY PROFILE" and includes a sidebar with "IMPORTANT FACTS ABOUT ICS COURIER SERVICE" and "YOU GET:" followed by a list of services: next day service, coast-to-coast coverage, proof of delivery, and unbeatable rates. The main text describes ICS as Canada's leading business-to-business courier company, offering document and package delivery with annual revenues of approximately \$85 million. It specializes in providing distribution services for the insurance, financial, travel, legal, beauty supplies, optical, dental and other industries across Canada. In addition to regular document and package delivery, ICS offers proof of delivery services, as well as large volume direct marketing mail distribution, shipping systems, and shipping software. A photo shows three business professionals in a meeting. Below the text, there is a photo of an ICS Courier van and a short paragraph starting with "As a business-to-business courier, ICS stops at the same locations and at the same time each day for its customers. This personalized service allows ICS' drivers to be the most knowledgeable and consultative in the industry as well as becoming experts in the industries served. This service consistency and reliability, as well as competitive pricing, are what make ICS a dominant courier within the Canadian marketplace."

¹¹ See Transport Canada, “Canadian Courier Market Size, Structure and Fleet Analysis Study,” www.tc.gc.ca/pol/en/Report/Courier2001/C2.htm.

reliability, as well as competitive pricing, helped to keep ICS growing in the Canadian marketplace.

By specializing, ICS Courier also bought some time before it had to make larger information systems investments. Its customers continued to demand package tracking, and the company made a significant investment in information systems. The company upgraded many of its support systems and successfully delivered an online package-tracking service. This was not an easy or inexpensive process for ICS Courier. Often, smaller companies risk losing the entire business if their investments in an information technology project are not successful.

When large companies invest heavily in information systems, the bar is raised for the entire industry. Some companies cannot compete, and they end up leaving the industry. Other companies do find a way to compete successfully, however. ICS Courier is an example of a smaller company that made a difficult transition in response to a change in information technology. This successful transition required a strong commitment to a company strategy focused on specialization and a successful implementation of information systems to support the strategy.

Questions

1. ICS Courier focused on business-to-business customers, servicing insurance companies, financial services, and health professionals. How did the fact that drivers arrived consistently at the same place and time support the strategy of specialization?
2. Why would offering package tracking through its website support the specialization strategy for ICS? Given the companies that ICS serves, do you think the company could survive long term without making this technology investment?
3. Do you think package tracking through the web is a disruptive technology? Justify your answer.
4. Can you think of another disruptive technology for the courier industry?



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WHAT DO YOU THINK?



The Digital Divide

An adage of investing is that it's easier for the rich to get richer. Someone who has \$10 million invested at 5 percent earns \$500 000 per year. Another investor with \$10 000 invested at that same 5 percent earns \$500 per year. Every year, the disparity increases as the first investor pulls further and further ahead of the second.

This same adage also applies to intellectual wealth. It's easier for those with considerable knowledge and expertise to gain even more knowledge and expertise. Someone who knows how to search the Internet can gather information more readily than someone who does not. And, every year, the person with greater knowledge pulls further and further ahead. Intellectual capital grows in the same way that financial capital grows.

Searching the Internet is not just a matter of knowledge, however: It's also a matter of access. The increasing reliance on the web for information and commerce has created a digital divide between those who have Internet access and those who do not. This divide continues to deepen as those who are connected pull further ahead of those who are not.

Various groups have addressed this problem by making Internet access available in public places, such as libraries, community centres, and retirement homes. But not everyone can be served this way, and even with this kind of access there's a big convenience

difference between going to the library and walking across your bedroom to access the Internet—and in your bedroom you don't have to stand in line.

The advantages accrue to everyone with access, every day. Do you want directions to your friend's house? Need to know when a movie is playing at a local theatre? Want to buy music, books, or tools? Need convenient access to your chequing account? Want to decide whether to refinance your condo? Want to know what TCP/IP means? Use the Internet.

All of this intellectual capital resides on the Internet because businesses benefit by putting it there. It's much cheaper to provide product support information over the Internet than in printed documents. The savings include not only the costs of printing, but also the costs of warehousing and mailing. As well, when product specifications change, an organization just updates its website. There is no obsolete material to dispose of and no costs for printing and distributing the revised material. Those who have Internet access gain current information faster than those who do not.

What happens to those who do not have Internet access? They fall further and further behind. The digital divide segregates the haves from the have-nots, creating new class structures. Such segregation is subtle, but it is segregation nonetheless.

Do organizations have a responsibility to address this matter? If 98 percent of our market segment has Internet access, do we have a responsibility to provide non-Internet materials to that other 2 percent? On what



DISCUSSION QUESTIONS

1. Do you see evidence of a digital divide on your campus? In your hometown? Among your relatives? Describe personal experiences you've had regarding the digital divide.
2. Do organizations have a legal responsibility to provide the same information for non-connected customers as they do for connected customers? If not, should laws be passed requiring organizations to do so?
3. Because it may be impossible to provide equal information, another approach for reducing the digital divide is for the government to enable non-connected citizens to acquire Internet access via subsidies and tax incentives. Do you favour such a program? Why or why not?
4. Suppose that nothing is done to reduce the digital divide and that it is allowed to grow wider and wider. What are the consequences? How will society change?

assumptions is that responsibility based? Does a government agency have a responsibility to provide equal information to those who have Internet access and those who do not? When those who are connected can obtain information nearly instantaneously, 24/7, is it even possible to provide equal information to the connected and the unconnected?

It's a worldwide problem. Connected societies and countries pull further and further ahead. How can any economy that relies on traditional mail compete with an Internet-based economy?

If you're taking MIS, you're already connected; you're already one of the haves, and you're already pulling ahead of the have-nots. The more you learn about information systems and their use in commerce, the faster you'll pull ahead. And so the digital divide increases.