

Chapter

What Would You Do?

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Key Terms

Concept Check

Self-Assessment

Management Decision

Management Team Decision

Develop Your Career Potential

Take Two Video

STUDENT RESOURCES

ThomsonNOW On the Job and Biz Flix video applications, concept tutorial, and concept exercise

Xtra! Four exhibit worksheets, author FAQs, quiz, Management News, and the video clips from the chapter with exercises

Web (<http://williams.swlearning.com>) Quiz, PowerPoint slides, and glossary terms for this chapter

Mayor's Office, London, England.¹ London has had serious traffic problems for more than a century. In the early 1900s, roads were so crowded with horses and wagons that traffic stood still for up to five hours a day. In 1935, a witness testifying for the Royal Commission on London Traffic said, "Unless we do provide some very far-reaching system, London will be almost unbearable in a few years." In 1951, the London & Home Counties Traffic Advisory Committee concluded that the "saturation point has been reached . . . traffic has outgrown the capacity of the streets." In 1959, the Ministry of Transport advised that the "traffic crisis will soon overtake the Metropolis." And in 1988, the secretary of state for transport said, "If we don't act, London will seize up in the next decade."

With a history like this, it's not surprising that London has the worst traffic jams in Europe; as London drivers spend 50 percent of their time *NOT* moving in their vehicles. In 1903, with horse-drawn carriages, traffic moved at a pace of 12

What Would You Do?

mph. Today, with cars and trucks, traffic has slowed to 9 mph! The reasons are straightforward. First, most of central London's streets are 400 to 600 years old; they were not designed for car and truck traffic and are narrow and cramped. Furthermore, whereas most of today's cities have straight roads, London's streets zig, zag, and confuse even the most experienced Londoners. In fact, on average London taxi drivers take two years to learn the city's streets in preparation for their licensing exams! Second, with a population of 7.2 million, London has too many people in cars and trucks trying to get through those narrow streets. Consequently, streets and bridges resemble parking lots, and on many streets, pedestrians move faster than vehicles. Russ Kane, a longtime London traffic reporter, says, "It's just the sheer weight of traffic. It happens all the time—you get to the end of a massive traffic jam and there's nothing there at all. It's just congestion. Pure and simple."

The question, of course, is what to do about the traffic. Over time, London has tried bobbies (police officers splattered with mud and horse droppings), the world's first traffic lights, and then coordinated, computerized traffic lights designed to keep traffic flowing. But nothing has worked.

So, rather than trying to control the traffic, London's mayor has decided to shrink it by charging a "Congestion Zone" fee of £5 (about \$9) per day for any vehicle that enters the eight square miles of central London between 7 A.M. and 6:30 P.M. on weekdays. Your job is to use information technology to create an inexpensive, reliable, fair method for imposing and collecting the fee. Never mind that you've only got a year to design the system, that there are 174 ways in and out of the Congestion Zone, that no other city has ever attempted such a program, that the mayor has staked his job (and yours) on this project, and that it will be incredibly difficult to do from a technological standpoint.

To impose the fee, you have to determine which vehicles are entering the Congestion Zone. With 250,000 vehicles entering each day, how can you accurately capture that information? Next, once you've collected data showing which vehicles have

entered—however you do that—you have to process those data into useful information so that you can charge the companies and people that own those vehicles the appropriate fees. Finally, you have to make the fee information accessible to everyone from truck drivers, to corporate accountants, to taxi drivers, and in a way that enables them to pay the fees quickly and easily so that they don't incur late payment penalties (ranging from \$75 to \$200). **If you were in charge of managing this information, what would you do?**

STUDY TIP

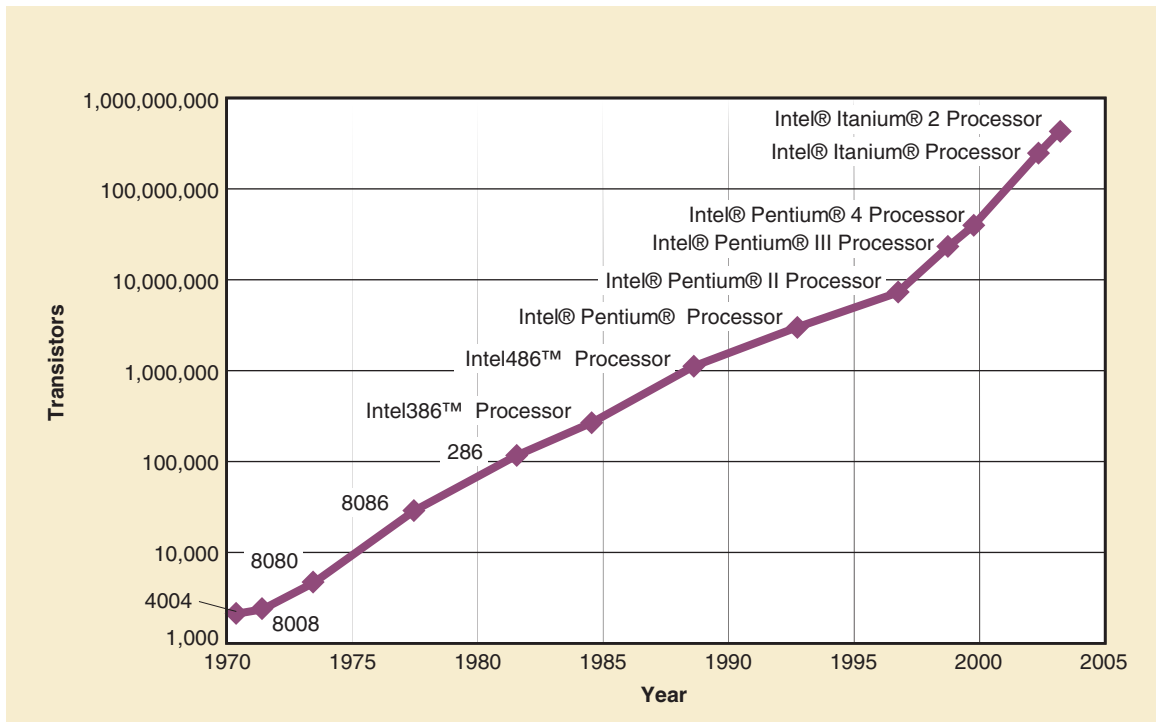
Imagine you are the professor, and make up your own test for Chapter 17. What are the main topics and key concepts that students should know? If you work with a study group, exchange practice tests. Work them individually, then "grade" them collectively. This way you can discuss trouble spots and answer each other's questions.

A generation ago, computer hardware and software had little to do with managing business information. Rather than storing information on hard drives, managers stored it in filing cabinets. Instead of uploading daily sales and inventory levels by satellite to corporate headquarters, they mailed hard-copy summaries to headquarters at the end of each month. Instead of word processing, reports were typed on an electric typewriter. Instead of spreadsheets, calculations were made on adding machines. Managers communicated by sticky notes, not email. Phone messages were written down by assistants and coworkers, not left on voice mail. Workers did not use desktop or laptop computers as a daily tool to get work done; they scheduled limited access time to run batch jobs on the mainframe computer (and prayed that the batch job computer code they wrote would work).

Today, a generation later, computer hardware and software are an integral part of managing business information. In large part, this is due to something called **Moore's law**. Gordon Moore is one of the founders of Intel Corporation, which makes 75 percent of the integrated processors used in personal computers. In 1965, Moore predicted that every 18 months, the cost of computing would drop by 50 percent as computer-processing power doubled.² As Exhibit 17.1 shows, Moore was right. Every few years, computer power, as measured by the number of transistors per computer chip, *has* more than doubled. Consequently, the computer sitting in your lap or your desk is not only smaller, but also much cheaper and more powerful than the large mainframe computers used by *Fortune* 500 companies 15 years ago. In fact, if car manufacturers had achieved the same power increases and cost decreases attained by computer manufacturers, a fully outfitted Lexus or Mercedes sedan would cost less than \$1,000!

We begin this chapter by explaining why information matters. In particular, you will learn the value of strategic information to companies, as well as the cost and characteristics of good information. Next, you will investigate how companies capture, process, and protect information. Finally, you'll learn how information is accessed and shared with those within and outside the company, and how knowledge and expertise (not just information or data) are shared, too.

Exhibit 17.1
Moore's Law



Source: "Moore's Law: Overviews," © Intel Corporation, [Online] available at <http://www.intel.com/research/silicon/mooreslaw.htm>, 27 June 2005. Reprinted with permission of Intel Corporation.

Why Information Matters

Raw data are facts and figures. For example, 11, \$452, 1, and 26,100 are some data that I used the day I wrote this section of the chapter. However, facts and figures aren't particularly useful unless they have meaning. For example, you probably can't guess what these four pieces of raw data represent, can you? And if you can't, these data are useless. That's why researchers make the distinction between raw data and information. Whereas raw data consist of facts and figures, **information** is useful data that can influence someone's choices and behavior. So what did those four pieces of data mean to me? Well, 11 stands for channel 11, the local CBS affiliate on which I watched part of the men's PGA golf tournament; \$452 is how much it would cost me to rent a minivan for a week if I go skiing over spring break; 1 is for the 1-gigabyte storage card that I want to add to my digital camera (prices are low, so I'll probably buy it); and 26,100 means that it's time to get the oil changed in my car.

raw data

Facts and figures.

information

Useful data that can influence people's choices and behavior.

After reading the next two sections, you should be able to

- 1** explain the strategic importance of information.
- 2** describe the characteristics of useful information (i.e., its value and costs).

1 STRATEGIC IMPORTANCE OF INFORMATION

If you asked most top managers whether they thought real estate (i.e., office space, factory space, etc.) was critical to their businesses, most would say no. By contrast, says Charles Woznick, president and CEO of Facility Information Systems (FIS), "If you talk to somebody who manufactures automobiles, they can tell you what each of 40,000 parts costs down to the penny, and how many they will need to make cars this year."³ According to Woznick, top managers should be paying attention to their real estate costs and gathering critical information to manage it. Using FIS's software, companies can determine how much vacant space they have, which workers are sitting at which desks, even if those desks are in New York, Hong Kong, or London, and whether they have enough space for their workers or will need to rent or build new space. Sprint, the telecommunications company, uses FIS to track 85,000 employees in its 23 million square feet of office space. Paul Savastano, Sprint's director of information technology, said, "You can say I have this many workstations nationwide, how many are vacant, and where they are. If I can find 100 workstations in the appropriate city or combination of buildings, I can save the company several million dollars over the term of a new lease."⁴

In today's hypercompetitive business environments, information, whether it's about real estate, product inventory, pricing, or costs, is as important as capital (i.e., money) for business success. It takes money to get businesses started, but businesses can't survive and grow without the right information. Information has strategic importance for organizations because it can be used to **1.1 obtain first-mover advantage** and **1.2 sustain a competitive advantage once it has been created**.

1.1 First-Mover Advantage

First-mover advantage is the strategic advantage that companies earn by being the first in an industry to use new information technology to substantially lower costs or to differentiate a product or service from that of competitors. For example, cable TV companies have taken a surprising lead over telephone companies in providing high-speed Internet access to people's homes. As I write this, 19.9 million homes have high-speed cable modems, compared to just 13.3 million that have high-speed digital subscriber lines from phone companies.⁵

first-mover advantage

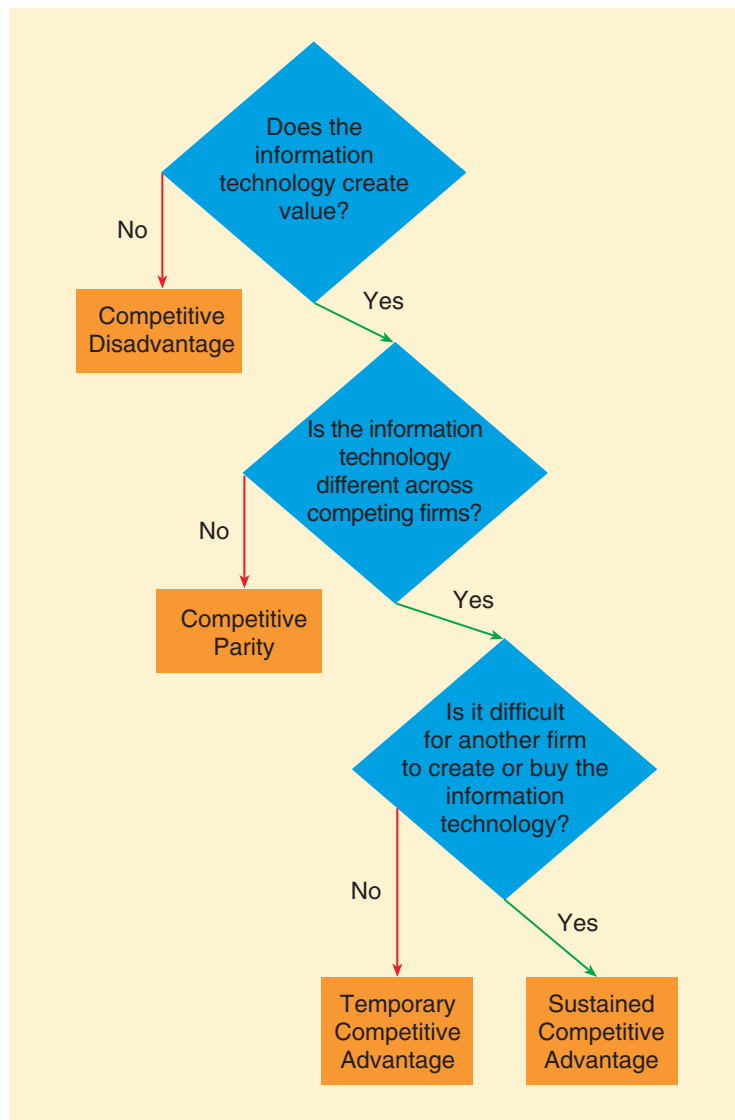
The strategic advantage that companies earn by being the first to use new information technology to substantially lower costs or to make a product or service different from that of competitors.

Cable companies invested \$90 billion to completely rewire their systems, replacing copper coaxial lines with digital lines that feed high-speed cable modems and digital TV cable channels alike (providing an average of 300 channels to compete with satellite TV like Dish Network or DirecTV).⁶ By contrast, the phone companies, ran into unexpected technical difficulties and high expenses and spent less than \$20 billion to bring high-speed DSL service to people's homes. Unlike cable systems, which are already able to provide high-speed Internet access in 99 percent of homes, the phone companies' systems can supply only 65 percent of households with DSL service. Robert Ingalls Jr., president of Verizon's retail market group (Verizon provides DSL services), says the battle "is going to be city by city, neighborhood by neighborhood. It's going to be us versus the cable incumbents."⁷

In all, first-mover advantages, like those established by high-speed Internet cable companies, can be sizable. On average, first movers earn a 30 percent market share, compared to 19 percent for the companies that follow.⁸ Likewise, over 70 percent of market leaders started as first movers.⁹

Exhibit 17.2

Using Information Technology to Sustain a Competitive Advantage



Source: Adapted from F. J. Mata, W. L. Fuerst, & J. B. Barney, "Information Technology and Sustained Competitive Advantage: A Resource-Based Analysis," *MIS Quarterly* 19, no. 4, December 1995, 487–505. Reprinted by special permission by the Society for Information Management and the Management Information Systems Research Center at the University of Minnesota.

1.2 Sustaining a Competitive Advantage

As described above, companies that use information technology to establish first-mover advantage usually have higher market shares and profits. According to the resource-based view of information technology shown in Exhibit 17.2, companies need to address three critical issues in order to sustain a competitive advantage through information technology. First, does the information technology create value for the firm by lowering costs or providing a better product or service? If an information technology doesn't add value, then investing in it would put the firm at a competitive disadvantage to companies that choose information technologies that do add value.

Second, is the information technology the same or different across competing firms? If all the firms have access to the same information technology and use it in the same way, then no firm has an advantage over another (i.e., competitive parity).

Third, is it difficult for another company to create or buy the information technology used by the firm? If so, then the firm has established a sustainable competitive advantage over competitors through information technology. If not, then the competitive advantage is just temporary, and competitors should eventually be able to duplicate the advantages the leading firm has gained from information technology. For more about sustainable competitive advantage and its sources, see Chapter 6 on organizational strategy.

In short, the key to sustaining a competitive advantage is not faster computers, more memory, and larger hard drives. The key is using information technology to continuously improve and support the core functions of a business.

Ron Ireland, a former Wal-Mart manager, said, “Wal-Mart has always considered information technology as a competitive advantage, never as a business expense.”¹⁰ Thanks to innovative use of information technology and the largest private satellite network and database system in the world, Wal-Mart’s costs are 10 percent lower than its competitors’ costs.¹¹ Wal-Mart was one of the first retailers to use computers and bar codes to track sales and inventory data and then share those data with suppliers. Today, Wal-Mart’s \$4 billion supplier network, Retail Link, allows vendors like Ted Haedicke of Coca-Cola to “look at how much [and what kind of] Coke [has] sold . . . and at what prices at any store in the Wal-Mart system.” He went on to say, “You can’t do that with any other retailer today.”¹²

Companies like Wal-Mart that achieve first-mover advantage with information technology and then sustain it with continued investment create a moving target that competitors have difficulty hitting.

Review 1: Strategic Importance of Information

The first company to use new information technology to substantially lower costs or differentiate products or services often gains first-mover advantage, higher profits, and larger market share. Creating a first-mover advantage can be difficult, expensive, and risky, however. According to the resource-based view of information technology, sustainable competitive advantage occurs when information technology adds value, is different across firms, and is difficult to create or acquire.

2 CHARACTERISTICS AND COSTS OF USEFUL INFORMATION

Portsmouth, a scenic city of 190,000 on the southern coast of England, attracts 6.5 million visitors a year, primarily because of its historic role as the home of the British Royal Navy. To handle the crush of visitors, Portsmouth relies on 320 buses, all equipped with computers and QDMA (quad-division multiple access) radio communication, which works reliably at speeds up to 250 miles per hour. Because the buses are networked, passengers waiting at bus stops can access a weatherproof computer terminal to find out when the next bus will arrive and what route that bus is taking. They can also check their email, use trip planning software to determine which bus routes to take, or swipe a credit card to purchase tickets. John Domblides, who works for Portsmouth’s Traffic Systems Group, says, “The response from the public using the new facilities has been very positive, largely due to the quality of both the information displayed and the infrastructure used—stainless-steel and glass bus shelters with bright displays.”¹³ The initial cost was £3.2 million or about \$6 million, and the annual cost is £200,000 or \$370,000.

As Portsmouth’s bus system demonstrates, information is useful when it is **2.1 accurate, 2.2 complete, 2.3 relevant, and 2.4 timely**. However, there can be significant **2.5 acquisition, 2.6 processing, 2.7 storage, 2.8 retrieval, and 2.9 communication costs associated with useful information**.

2.1 Accurate Information

Information is useful when it is accurate. Before relying on information to make decisions, you must know that the information is correct. For example, almost 200,000 times a year, hospitals give patients the wrong medicine. Although most of those errors are caught before the patient takes the medicine, 1.7 percent of the time lifesaving measures must be taken to correct for those mistakes.¹⁴ Yet, when the University of Illinois at Chicago Medical Center began using a computerized physician order entry system, treatment mistakes, particularly adverse drug events in which patients receive the wrong medicine

or an incorrect dosage of the right medicine, were reduced by an amazing 55 percent. Why? Instead of being scrawled in doctors' illegible handwriting, prescription orders are typed under the new system, so the instructions are far more accurate. Because the system also checks for and prevents harmful drug interactions, order errors were ultimately reduced by 86 percent.¹⁵

2.2 Complete Information

Information is useful when it is complete. Incomplete or missing information makes it difficult to recognize problems and identify potential solutions. For example, dispatchers at Con-Way Central Express are responsible for choosing truck routes that maximize trailer loads, minimize expenses (time, miles, and fuel), and get drivers home as soon as possible. On a typical day, Con-Way's dispatchers must consider the number of trucks (2,100) and available drivers (varies), locations (200 across 25 states), shipments (typically 50,000), and the tonnage and trailer capacity for that day. Though Con-Way's dispatchers do extremely well, they typically have only 85 percent of the information they need. Because they lack information about last-minute changes in orders, weather, accidents, driver no-shows, and breakdowns, they end up assigning longer, less efficient truck routes with less than full trucks that ultimately increase costs by \$5 million per year.¹⁶

2.3 Relevant Information

One of the key criteria for useful information is that it be timely. This humorous ad for Pitney-Bowes conveys that fact with a simple tag line, "The British Were Here!"

You can have accurate, complete information, but if it doesn't pertain to the problems you're facing, then it's irrelevant and not very useful. Con-Way Express dispatchers not only lacked complete information, they also lacked relevant information about their problems. To address these issues, the company spent \$3 million over five years to build a computerized truck route optimization system. This system tracks all customer shipment requests (which can be made as late as 5:15 P.M. each day) and communicates by satellite with each truck to monitor truck availability, loads, miles, fuel, weather, and accidents. Then, armed with all of this relevant information, it cranks out optimal truck routes in just seven minutes. On an average day, this system allows Con-Way to use 111 fewer trucks and 68 fewer drivers, drive 26,000 fewer miles, and increase the load in each truck by 370 revenue-generating pounds. Route optimization analyst Marty Robinson says, "It saves us a lot of time each night, which we use to make sure we've got accurate order information, look into problems and handle changes."¹⁷

“THE BRITISH WERE HERE! THE BRITISH WERE HERE!”

Information that's delivered late is useless. Not to mention costly. Of course, that's not something that happens at your company. Or is it?

Producing and delivering business communications seems simple enough. Why, then, are important notices so often sent out late? Why are critical packages mailed with too little postage? Why are digital documents frequently lost in cyberspace? It all adds up to a logjam that prevents revenue from ever reaching your bottom line.

Pitney Bowes can help. Through a combination of unique products and high-value services, we can generate remarkable changes across your entire business and, often, a sizeable increase in profits.

A good example: We helped a major financial institution reduce statement processing time by two days and cut reprints by over 50%. The result? Increased productivity from existing equipment plus savings of over \$1 million a year.

Find out how we can achieve similar results for you. Call 1 866 DOC FLOW or visit pb.com/communication

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2.4 Timely Information

Finally, information is useful when it is timely. To be timely, the information must be available when needed to define a problem or to begin to identify possible solutions. If you've ever thought, "I wish I had known that earlier," then you understand the importance of timely information and the opportunity cost of not having it. For instance, Health Decisions is a company that designs and runs clinical drug-testing trials for pharmaceutical companies. To provide timely access to study results, it records data using specially designed bubble forms (like multiple-choice test Scantrons).

By scanning a form every second, the company can read up to 8,000 per day—entering the same amount of data by hand would take months. This allows medical clinics and labs to verify and correct their data just four days after sending the data to Health Decisions. By contrast, the industry average is 122 days. How much does this matter? A Health Decisions study of a potential Alzheimer’s drug based on 450,000 pages of data was completed in three and a half years rather than seven. Although the Food and Drug Administration did not approve the drug, completing the research so quickly saved the pharmaceutical company three and a half years and \$32 million in additional expenses that it was able to put toward the development of another drug.¹⁸

2.5 Acquisition Costs

Acquisition cost is the cost of obtaining data that you don’t have. For example, among other things, Acxiom, a billion-dollar company, gathers and processes data for direct-mail marketing companies. If you’ve received an unsolicited, “preapproved” credit card application recently (and who hasn’t?), chances are Acxiom helped the credit card company gather information about you. Where does Acxiom get that information? The first place it turns is to companies that sell consumer credit reports at a wholesale cost of \$1 each. Acxiom also obtains information from retailers. Each time you use your credit card, retailers’ checkout scanners gather information about your spending habits and product preferences. Many retailers sell this information to companies like Acxiom that use it for market research. So why pay for this information? The reason is that acquiring it can help credit card companies do a better job of identifying who will mail back a signed credit card application and who will rip the credit card application in half and toss it in the trash.¹⁹

2.6 Processing Costs

Companies often have massive amounts of data, but not in the form or combination they need. Consequently, **processing cost** is the cost of turning raw data into usable information. For example, Celanese, a \$4.5 billion chemical company, has 12,000 employees in 30 facilities in 11 countries that use 13 different computer systems that can’t “talk” to each other or share data. Celanese’s chief information officer (CIO) Karl Wachs said, “Top management calls this inefficiency. The lower guys [in the company] call it stupidity.”²⁰ Therefore, over a two-year period, Celanese expected to spend at least \$60 million and as much as \$146 million to integrate these 13 incompatible systems into one.

2.7 Storage Costs

Storage cost is the cost of physically or electronically archiving information for later use and retrieval. One of the reasons that credit card companies and other *Fortune* 500 companies hire Acxiom is that it maintains a database of the following information on over 250 million Americans: age, estimated income, home ownership, cars owned, occupation, children, number of credit cards, and more. All of that information, between 1.5 and 2 petabytes (a petabyte is 2,000 terabytes, and a terabyte is the same as 500 million pages of single-spaced text), is cleaned, transformed from data to information, and then stored in Acxiom’s massive, secure, underground “data warehouses” in Little Rock, Arkansas, Downer’s Grove, Illinois, and Sunderland, England.²² Besides its own data,

acquisition cost

The cost of obtaining data that you don’t have.

processing cost

The cost of turning raw data into usable information.

RECYCLING AND DISPOSING OF COMPUTER EQUIPMENT

With most companies replacing computers every four years, an estimated 250 million computers will be discarded over the next five years. Computers and computer monitors contain hazardous materials, however, so you can’t just toss them in the trash. Doing that is not just wrong—it’s against the law. Instead, contact your state’s department of environmental protection for help in finding a recycling company. Or, donate your old computers to deserving individuals or charitable organizations. Or, sell the computers at a steep discount to your employees. And, when you buy your new corporate computers, bargain with the vendor to make it responsible for recycling those computers the next time around.²¹

DOING THE RIGHT THING

storage cost

The cost of physically or electronically archiving information for later use and retrieval.

Acxiom stores an additional 20 billion customer and prospect (i.e., potential customer) records for its 1,000 corporate clients. Acxiom's CEO says, "We like to think that these [corporate] customers look at the Acxiom data center as an extension of their own data centers."²³

2.8 Retrieval Costs

retrieval cost

The cost of accessing already-stored and processed information.

Retrieval cost is the cost of accessing already-stored and processed information. One of the most common misunderstandings about information is that it is easy and cheap to retrieve once the company has it. Not so. First, you have to find the information. Then, you've got to convince whoever has it to share it with you. Then the information has to be processed into a form that is useful for you. By the time you get the information you need, it may not be timely anymore. Before the University of Illinois at Chicago Medical Center switched to the electronic physician order system described above, doctors resisted the change, fearing that the new system would slow them down (i.e., high retrieval costs). Dr. Patrick Tranmer said, "I have a maximum of 20 minutes to do everything when I see a patient. I have to find out what's wrong, get their history, do a physical exam, make a phone call, write a prescription, instruct the patient, make a follow-up appointment and then educate a student doctor about what I've just done."²⁴ The doctors were pleasantly surprised to find that the new system actually reduced retrieval costs. Before the new system, doctors and nurses used to waste time tracking down patient information. Now, when X-rays and lab reports are completed, they are immediately available for review at any computer in the hospital. When doctors noticed that it only took nurses 1 minute (rather than 10) to obtain these medical records, they started retrieving the X-rays and lab reports themselves, freeing nurses to spend more time attending to patients.²⁵ Overall, the new system saves physicians 130,000 hours a year.

2.9 Communication Costs

communication cost

The cost of transmitting information from one place to another.

Communication cost is the cost of transmitting information from one place to another. For example, the most important information that an electric utility company collects each month is the information from the electric meter attached to the side of your house. Traditionally, electric companies employed meter readers to walk from house to house to gather information that would then be entered into company computers. Now, however, meter readers are losing their jobs to water, gas, and electric meters built with radio frequency (RF) transmitters (see Section 3.1 for more on this technology). The transmitters turn on when a meter reader drives by the house in a utility company van with a laptop computer that is specially equipped to receive the RF signals. Such a van, traveling at legal speeds, can read 12,000 to 13,000 meters in an eight-hour day. By contrast, a meter reader on foot would record data from 500 meters per day.²⁶ The Niagara Mohawk utility company in New York is spending \$100 million over three years to install 2 million meters with RF transmitters, but expects to save \$15 to \$20 million a year in communication costs once they're installed.

Review 2: Characteristics and Costs of Useful Information

Raw data are facts and figures. Raw data do not become information until they are in a form that can affect decisions and behavior. For information to be useful, it has to be reliable and valid (accurate), of sufficient quantity (complete), pertinent to the problems you're facing (relevant), and available when you need it (timely). Useful information does not come cheaply. The five costs of obtaining good information are the costs of acquiring, processing, storing, retrieving, and communicating information.

Getting and Sharing Information

In 1907, Metropolitan Life Insurance built a huge office building in New York City for its brand new, state-of-the-art information technology system. What was this great breakthrough in information management? The advanced system was card files. That's right, the same card file systems that every library in America used before computers. Metropolitan Life's information "technology" consisted of 20,000 separate file drawers that sat in hundreds of file cabinets more than 15 feet tall. This filing system held 20 million insurance applications, 700,000 accounting books, and 500,000 death certificates. Metropolitan Life employed 61 workers who did nothing but sort, file, and climb ladders to pull files as needed.²⁷

Less than a century later, the cost, inefficiency, and ineffectiveness of using this formerly state-of-the-art system would put an insurance company out of business within months. Today, if storms, fire, or accidents damage policyholders' property, insurance companies write checks on the spot to cover the losses. When policyholders buy a car, they call their insurance agent from the dealership to activate their insurance before driving off in their new car. And now, insurance companies are marketing their products and services to customers directly from the Internet.

From card files to Internet files in just under a century, the rate of change in information technology is spectacular. After reading the next two sections, you should be able to

- 3** explain the basics of capturing, processing, and protecting information.
- 4** describe how companies can access and share information and knowledge.

3 CAPTURING, PROCESSING, AND PROTECTING INFORMATION

When you go to your local Rite Aid pharmacy to pick up a prescription, the pharmacist reviews an electronic file that shows all of the medications you're taking. That same system automatically checks to make sure that your new prescription won't create adverse side effects by interacting with your other medications. When you pay for your prescription, Rite Aid's point-of-sale information system determines whether you've written any bad checks lately (to Rite Aid or other stores), records your payment, and then checks with the computer of the pharmaceutical company that makes your prescription drugs to see if it's time to reorder. Finally, Rite Aid protects your information to make sure that your data are readily available only to you, your physician, and your pharmacist.

In this section, you will learn about the information technologies that companies like Rite Aid use to **3.1 capture**, **3.2 process**, and **3.3 protect information**.

3.1 Capturing Information

There are two basic methods of capturing information: manual and electronic. Manual capture of information is a labor-intensive process, which entails recording and entering data by hand into a data storage device. For example, when you applied for a driver's license, you probably recorded personal information about yourself by filling out a form. Then, after you passed your driver's test, someone typed your handwritten information into the department of motor vehicles' computer database so that local and state police could access it from their patrol cars when they pulled you over for speeding. (Isn't information great?) The problem with manual capture of information is that it is slow, expensive, and often inaccurate.



AP PHOTO/DONNA McWILLIAM

RFID technology is in use at this Carrollton, Texas loading dock. Boxes equipped with RFID tags speed along a conveyor belt and are recorded by the computer workstation. The system eliminates the need for workers to scan every box with a handheld device and so is more accurate.

bar code

A visual pattern that represents numerical data by varying the thickness and pattern of vertical bars.

radio frequency identification (RFID) tags

Tags containing minuscule microchips that transmit information via radio waves and can be used to track the number and location of the objects into which the tags have been inserted.

electronic scanner

An electronic device that converts printed text and pictures into digital images.

optical character recognition

The ability of software to convert digitized documents into ASCII text (American Standard Code for Information Interchange) that can be searched, read, and edited by word processing and other kinds of software.

processing information

Transforming raw data into meaningful information.

Consequently, companies are relying more on electronic capture, in which data are electronically recorded and entered into electronic storage devices. Bar codes, radio frequency identification tags, and document scanners are methods of electronically capturing data. **Bar codes** represent numerical data by varying the thickness and pattern of vertical bars. The primary advantage that bar codes offer is that the data they represent can be read and recorded in an instant with a handheld or pen-type scanner. One pass of the scanner (okay, sometimes several) and “beep!” The information has been captured. Bar codes cut checkout times in half, reduce data entry errors by 75 percent, and save stores money because stockers don’t have to go through

the labor-intensive process of putting a price tag on each item in the store.²⁸

Radio frequency identification (RFID) tags contain minuscule microchips and antennas that transmit information via radio waves.²⁹ Unlike bar codes, which require direct line-of-sight scanning, RFID tags are read by turning on an RFID reader that, like a radio, tunes into a specific frequency to determine the number *and* location of products, parts, or anything else to which the RFID tags are attached. Turn on an RFID reader, and every RFID tag within the reader’s range (from several hundred to several thousand feet) is accounted for. For example, Sky Chefs, the company that prepares onboard meals for the airlines, uses RFID tags to keep track of the \$1,000 heavy-duty serving carts used to wheel hot meals up and down crowded airplane aisles. With airlines losing or misplacing up to 1,500 carts per month, Sky Chefs found that installing RFID readers throughout airports and attaching RFID tags to serving carts was an easy, inexpensive way to locate and recover all of its carts.³⁰ And with RFID readers able to process 96 RFID tags per second, it takes Sky Chefs only a couple of minutes to determine the locations. RFID tags vary in cost from 25 cents to \$5 per tag, depending on their capabilities and the amount of information they can store and send.³¹

Because they are inexpensive and easy to use, **electronic scanners**, which convert printed text and pictures into digital images, have become an increasingly popular method of electronically capturing data. The first requirement for a good scanner is a *document feeder* that automatically feeds document pages into the scanner or turns the pages (often with a puff of air) when scanning books or bound documents.³² Text that has been digitized cannot be searched or edited like the regular text in your word processing software, however, so the second requirement for a good scanner is **optical character recognition** software to scan and convert original or digitized documents into ASCII text (American Standard Code for Information Interchange) or Adobe PDF documents. ASCII text can be searched, read, and edited with standard word processing, email, desktop publishing, database management, and spreadsheet software, whereas PDF documents can be searched and edited with Adobe’s Acrobat software. Sloans Lake Managed Care, a Colorado health-care organization, uses scanners and optical character recognition software to read the medical claims forms submitted by the 450,000 people covered by its health plan. Sloans Lake can scan 450 to 500 characters per form with 98 percent accuracy. As a result, it now automatically scans and processes over 5,000 claims forms per day and has lowered the time for processing claims by an average of 65 percent.³³

3.2 Processing Information

Processing information means transforming raw data into meaningful information that can be applied to business decision making. Evaluating sales data to determine the best- and worst-selling products, examining repair records to

determine product reliability, and monitoring the cost of long-distance phone calls are all examples of processing raw data into meaningful information. And, with automated, electronic capture of data, increased processing power, and cheaper and more plentiful ways to store data, managers no longer worry about getting data. Instead, they scratch their heads about how to use the overwhelming amount of data that pours into their businesses every day. Furthermore, most managers know little about statistics and have neither the time nor the inclination to learn how to use them to analyze data.

One promising tool to help managers dig out from under the avalanche of data is data mining. **Data mining** is the process of discovering unknown patterns and relationships in large amounts of data.³⁴ Data mining works by using complex algorithms such as neural networks, rule induction, and decision trees. If you don't know what those are, that's okay. With data mining, you don't have to. Most managers only need to know that data mining looks for patterns that are already in the data but are too complex for them to spot on their own. For example, data mining helped a credit card company determine that people who fill out credit applications in pencil are much less likely to pay their credit card bills. It now scrutinizes those applications much more closely. Data mining also helped Victoria's Secret find out that it sold 20 times more size 32 bras in New York City (no one is sure why) and that ivory bras were 10 times more popular in Miami than black bras. Because of these discoveries, Victoria's Secret now customizes product inventory for each of its stores.³⁵

Data mining typically splits a data set in half, finds patterns in one half, and then tests the validity of those patterns by trying to find them again in the second half of the data set. The data typically come from a **data warehouse** that stores huge amounts of data that have been prepared for data mining analysis by being cleaned of errors and redundancy. For example, earlier in the chapter you read about Acxiom, which has 1.5 to 2 petabytes of information in storage at its data warehouses.

The data in a data warehouse can then be analyzed using two kinds of data mining. **Supervised data mining** usually begins with the user telling the data mining software to look and test for specific patterns and relationships in a data set. Typically, this is done through a series of "what if?" questions or statements. For instance, a grocery store manager might instruct the data mining software to determine if coupons placed in the Sunday paper increase or decrease sales. By contrast, with **unsupervised data mining**, the user simply tells the data mining software to uncover whatever patterns and relationships it can find in a data set. For example, State Farm Insurance used to have three pricing categories for car insurance, depending on your driving record: preferred for the best drivers, standard for typical drivers, and nonstandard for the worst drivers. Now, however, it has moved to "tiered pricing" based on the 300 different kinds of driving records that its data mining software was able to discover. This allows State Farm to be much more precise in matching 300 different price levels to 300 different kinds of driving records.³⁶

Unsupervised data mining is particularly good at identifying association or affinity patterns, sequence patterns, and predictive patterns. It can also identify what data mining "techie" call data clusters.³⁷ **Association or affinity patterns** occur when two or more database elements tend to occur together in a significant way. Surprisingly, Osco Drugs, based in Chicago, found that beer and diapers tended to be bought together between 5 and 7 P.M. The question, of course, was "why?" The answer, on further review, was fairly straightforward: fathers, who were told by their wives to buy some diapers on their way home, decided to pick up a six-pack for themselves, too.³⁸ Likewise, because Wal-Mart's data mining indicated that people tend to buy bananas and cereal at the same time, Wal-Mart now places bananas near the cereal aisle, in addition to the fruits and vegetables aisle.³⁹

Sequence patterns occur when two or more database elements occur together in a significant pattern, but with one of the elements preceding the other. When TWA

data mining

The process of discovering unknown patterns and relationships in large amounts of data.

data warehouse

Stores huge amounts of data that have been prepared for data mining analysis by being cleaned of errors and redundancy.

supervised data mining

The process when the user tells the data mining software to look and test for specific patterns and relationships in a data set.

unsupervised data mining

The process when the user simply tells the data mining software to uncover whatever patterns and relationships it can find in a data set.

association or affinity patterns

When two or more database elements tend to occur together in a significant way.

sequence patterns

When two or more database elements occur together in a significant pattern, but one of the elements precedes the other.

announced a low \$360 round-trip ticket between Los Angeles and San Juan, Puerto Rico, Travelocity.com, one of the largest Web travel companies used data mining to identify the customers most likely to buy a discounted ticket. A sequence pattern allowed managers to target all the customers in the area who had already used Travelocity's Web site to investigate fares to San Juan. In other words, people who had previously inquired about fares for this route (step 1) would be more likely to buy the discounted fare (step 2) if they knew about it. Indeed, an amazing 25 percent of the 30,000 customers Travelocity notified either bought the discounted flight to Puerto Rico or another flight to the Caribbean.⁴⁰

Predictive patterns are just the opposite of association or affinity patterns. Whereas association or affinity patterns look for database elements that seem to go together, **predictive patterns** help identify database elements that are different. On the day after Thanksgiving, typically the busiest shopping day of the year, Wal-Mart's data mining indicated that sales were unexpectedly slow for a boxed computer and printer combination that was offered at an extremely good price. Sales were slow everywhere, except one Wal-Mart store where sales greatly exceeded expectations. After noting the difference, headquarters called the store manager who said that the products were displayed in an open box that made it clear to customers that the low price was for the computer *and* the printer. Sales took off at all stores after headquarters relayed this simple message, "Open the box."⁴¹

predictive patterns

Patterns that help identify database elements that are different.

data clusters

When three or more database elements occur together (i.e., cluster) in a significant way.

Data clusters are the last kind of pattern found by data mining. **Data clusters** occur when three or more database elements occur together (i.e., cluster) in a significant way. For example, after analyzing several years worth of repair and warranty claims, Ford might find that, compared to cars built in its Chicago plant, the cars it builds in Atlanta (first element) are more likely to have problems with overtightened fan belts (second element) that break (third element) and result in overheated engines (fourth element), ruined radiators (fifth element), and payments for tow trucks (sixth element), which are paid for by Ford's three-year, 36,000 mile warranty.

Traditionally, data mining has been very expensive and very complex. Today, however, data mining services and analysis are much more affordable and within reach of most companies' budgets. And, if it follows the path of most technologies, it will become even easier and cheaper to use in the future.

3.3 Protecting Information

protecting information

The process of ensuring that data are reliably and consistently retrievable in a usable format for authorized users, but no one else.

Protecting information is the process of ensuring that data are reliably and consistently retrievable in a usable format for authorized users, but no one else. For instance, when customers purchase prescription medicine at Drugstore.com, an online drugstore and health-aid retailer, they want to be confident that their medical and credit card information is available only to them, the pharmacists at Drugstore.com, and their doctors. In fact, Drugstore.com has an extensive privacy policy (click "Privacy Policy" at <http://www.drugstore.com>) to make sure this is the case.

Companies like Drugstore.com find it necessary to protect information because of the numerous security threats to data and data security listed in Exhibit 17.3. People inside and outside companies can steal or destroy company data in various ways including denial-of-service Web server attacks that can bring down some of the busiest and best-run sites on the Internet; viruses and spyware/adware that spread quickly and can result in data loss and business disruption; keystroke monitoring in which every mouse click and keystroke you make is unknowingly monitored, stored, and sent to unauthorized users; password cracking software that steals supposedly secure passwords; and phishing, where fake, but real-looking emails and Web sites trick users into sharing personal information (user names, passwords, account numbers, etc.) that leads to unauthorized account access. Indeed, on average, 19 percent of computers are infected with viruses,

Exhibit 17.3

Security Problem	Source	Affects	Severity	The Threat	The Solution
Denial of service, Web server attacks, and corporate network attacks	Internet hackers	All servers	High	Loss of data, disruption of service, and theft of service	Implement firewall, password control, serverside review, threat monitoring, and bug fixes, and turn PCs off when not in use.
Password cracking software and unauthorized access to PCs	Local area network, Internet	All users, especially digital subscriber line and cable Internet users	High	Hackers take over PCs. Privacy can be invaded. Corporate users' systems are exposed to other machines on the network.	Close ports and firewalls, disable file and print sharing, and use strong passwords.
Viruses, worms, Trojan horses, and rootkits	Email, downloaded and distributed software	All users	Moderate to high	Monitor activities and cause data loss and file deletion: compromise security by sometimes concealing their presence.	Use antivirus software and firewalls, and control Internet access.
Spyware, adware, malicious scripts and applets	Rogue Web pages	All users	Moderate to high	Invade privacy, intercept passwords, and damage files or file system.	Disable browser script support, and use security, blocking, and spyware/adware software.
Email snooping	Hackers on your network and the Internet	All users	Moderate to high	People read your email from intermediate servers or packets, or they physically access your machine.	Encrypt message, ensure strong password protection, and limit physical access to machines.
Keystroke monitoring	Trojan horses, people with direct access to PCs	All users	High	Records everything typed at the keyboard and intercepts keystrokes before password masking or encryption occurs.	Use antivirus software to catch Trojan horses, control Internet access to transmission, and implement system monitoring and physical access control.
Phishing	Hackers on your network and the Internet	All users, including customers	High	Fake, but real-looking emails and Web sites that trick users into sharing personal information on what they wrongly thought was the company's	Educate and warn users and customers about the dangers. Encourage both not to click on potentially fake

(Continued)

Exhibit 17.3 (continued)

Security Problem	Source	Affects	Severity	The Threat	The Solution
				Web site. This leads to unauthorized account access.	URLs, which might take them to phishing Web sites. Instead, have them type your company's URL into the Web browser.
Spam	Email	All users and corporations	Mild to high	Clogs and overloads email servers and inboxes with junk mail. HTML-based spam may be used for profiling and identifying users.	Filter known spam sources and senders on email servers, and have users create further lists of approved and unapproved senders on their personal computers.
Cookies	Web sites you visit	Individual users	Mild to moderate	Trace Web usage and permit the creation of personalized Web pages that track behavior and interest profiles.	Use cookie managers to control and edit cookies, and use ad blockers.

Sources: K. Bannan, "Look Out: Watching You, Watching Me," *PC Magazine*, July 2002, 99; A. Dragoon, "Fighting Phish, Fakes, and Frauds," *CIO*, 1 September 2004, 33; B. Glass, "Are You Being Watched?" *PC Magazine*, 23 April 2002, 54; K. Karagiannis, "DDoS: Are You Next?" *PC Magazine*, January 2003, 79; B. Machrone, "Protect & Defend," *PC Magazine*, 27 June 2000, 168–181.

Exhibit 17.3

Security Threats to Data and Data Networks

80 percent have spyware, and only one-third are running behind a protected firewall (see below). Studies show that the threats listed in Exhibit 17.3 are so dire that automatic attacks will begin on an unprotected computer just 15 seconds after it goes live on the Internet.⁴²

As shown in the right-hand column of Exhibit 17.3, numerous steps can be taken to secure data and data networks. Some of the most important are authentication and authorization, firewalls, antivirus software for PCs and email servers, data encryption, and virtual private networks.⁴³ We will review those steps and then finish this section with a brief review of the dangers of wireless networks, which are exploding in popularity.

Two critical steps are required to make sure that data can be accessed by authorized users and no one else. One is **authentication**, that is, making sure users are who they claim to be.⁴⁴ The other is **authorization**, that is, granting authenticated users approved access to data, software, and systems.⁴⁵ For example, when an ATM prompts you to enter your personal identification number (PIN), the bank is authenticating that you are you. Once you've been authenticated, you are authorized to access your funds and no one else's. Of course, as anyone who has lost a PIN or password or had one stolen knows, user authentication systems are not foolproof. In particular, users create security risks by not changing their default account passwords (such as birth dates) or by using weak passwords such as names ("Larry") or complete words ("football") that are quickly guessed by password cracker software.⁴⁶ (See the Doing the Right Thing about "Password Dos and Don'ts" to learn how to prevent this.)

This is why many companies are now turning to **two-factor authentication**, which is based on what users know, such as a password, and what they have,

authentication

Making sure potential users are who they claim to be.

authorization

Granting authenticated users approved access to data, software, and systems.

two-factor authentication

Authentication based on what users know, such as a password, and what they have in their possession, such as a secure ID card or key.

such as a secure ID card. For example, employees at Bloomberg, a global provider of business news, data, and analysis, must enter a password, such as a four-digit personal identification number, plus a secure number that changes every 60 seconds and is displayed on the tiny screen of the secure electronic ID (about the size of a pack of gum) they carry. For these same reasons, some companies are turning to biometrics for authentication. With **biometrics** such as fingerprint recognition or iris scanning, users are identified by unique, measurable body features.⁴⁷ Troy Appling, vice president of The Bankers Bank, says, “With fingerprint biometrics, we can reduce the risk of unauthorized people making millions of dollars off fraudulent transfers. And we don’t have to spend up to 60 percent of our IT [information technology] time resolving lost or forgotten passwords.”⁴⁸ Of course, since some fingerprint scanners can be fooled by fingerprint molds, some companies take security measures even further by requiring users to simultaneously scan their fingerprint *and* insert a secure, smart card containing a digital file of their fingerprint. This is another form of two-factor authentication.

Unfortunately, stolen or cracked passwords are not the only way for hackers and electronic thieves to gain access to an organization’s computer resources. Unless special safeguards are put in place, every time corporate users are online there’s literally nothing between their personal computers and the Internet (home users with high-speed DSL or cable Internet access face the same risks). Hackers can access files, run programs, and control key parts of computers if precautions aren’t taken. To reduce these risks, companies use **firewalls**, hardware or software devices that sit between the computers in an internal organizational network and outside networks, such as the Internet. Firewalls filter and check incoming and outgoing data. They prevent company insiders from accessing unauthorized sites or from sending confidential company information to people outside the company. Firewalls also prevent outsiders from identifying and gaining access to company computers and data. Indeed, if a firewall is working properly, the computers behind the company firewall literally cannot be seen or accessed by outsiders.

A **virus** is a program or piece of code that, against your wishes, attaches itself to other programs on your computer and can trigger anything from a harmless flashing message to the reformatting of your hard drive to a systemwide network shutdown.⁴⁹ You used to have to do or run something to get a virus, such as double-clicking an email attachment or booting your computer from an infected floppy disk. Today’s viruses are much more threatening. In fact, with some viruses, just being connected to a network can infect your computer.⁵⁰ *Antivirus software for personal computers* scans email, downloaded files, and computer hard drives, disk drives, and memory to detect and stop computer viruses from doing damage. However, this software is effective only to the extent that users of individual computers have and use up-to-date versions. With new viruses appearing all the time, users should update their antivirus software weekly or, even better, configure their virus software to automatically check for, download, and install updates. By contrast, *corporate antivirus software* automatically scans email attachments, such as Microsoft Word documents, graphics, or text files, as they come across the company email server. It also monitors and scans all file downloads across company databases and network servers. So, while antivirus software for personal computers prevents individual computers from being infected, corporate antivirus software for email servers, databases, and network servers adds another layer of protection by preventing infected files from multiplying and being sent to others.

Another way of protecting information is to encrypt sensitive data. **Data encryption** transforms data into complex, scrambled digital codes that can be unencrypted only by authorized users who possess unique decryption keys. One method of data encryption is to use products by PGP (Pretty Good Privacy) (<http://www.pgp.com>) to encrypt the files stored on personal computers or

biometrics

Identifying users by unique, measurable body features, such as fingerprint recognition or iris scanning.

firewall

A protective hardware or software device that sits between the computers in an internal organizational network and outside networks, such as the Internet.

virus

A program or piece of code that, against your wishes, attaches itself to other programs on your computer and can trigger anything from a harmless flashing message to the reformatting of your hard drive to a systemwide network shutdown.

data encryption

The transformation of data into complex, scrambled digital codes that can be unencrypted only by authorized users who possess unique decryption keys.

PASSWORD DOS AND DON'TS

Anyone with access to sensitive personal (personnel or medical files), customer (credit cards), or corporate data (costs) has a clear responsibility to protect those data from unauthorized access. Use the following dos and don'ts to maintain a "strong" password system and protect your data.

- Don't use any public information such as part of your name, address, or birth date to create a password.
- Don't use complete words, English or foreign, that are easily guessed by password software using "dictionary attacks."
- Use eight or more characters and include some unique characters such as !@#\$ to create passwords like "cow@#boy."
- The longer the password and the more unique characters, the more difficult it is to guess.
- Consider using "passphrases," such as "My European vacation starts July 8th," instead of shorter passwords. The longer password, including upper- and lowercase letters, spaces, and numbers, is easy to remember and much, much more difficult to guess using password cracking software.
- Remember your password and don't write it down on a sticky note attached to your computer.
- Change your password every six weeks. Better yet, specify that your computer system force all users to change their passwords this often.
- Don't reuse old passwords.

Together, these basic steps can make it much more difficult to gain unauthorized access to sensitive data.⁵²

virtual private network (VPN)

Software that securely encrypts data sent by employees outside the company network, decrypts the data when they arrive within the company computer network, and does the same when data are sent back to employees outside the network.

secure sockets layer (SSL) encryption

Internet browser-based encryption that provides secure off-site Web access to some data and programs.

network servers and databases. This is especially important with laptop computers, which are easily stolen. And, with people increasingly gaining unauthorized access to email messages—email snooping—it's also important to encrypt sensitive email messages and file attachments. You can use a system called "public key encryption" to do so. First, give copies of your "public key" to anyone who sends you files or email. Have the sender use the public key, which is actually a piece of software, to encrypt files before sending them to you. The only way to decrypt the files is with a companion "private key" that you keep to yourself. If you want to learn more or want to begin encrypting your own files, download a free copy of Pretty Good Privacy from <http://web.mit.edu/pgp>.⁵¹

Although firewalls can protect personal computers and network servers connected to the corporate network, people away from their offices (e.g., salespeople, business travelers, telecommuters who work at home) who interact with their company networks via the Internet face a security risk. Because Internet data are not encrypted, packet sniffer software (see Exhibit 17.3) easily allows hackers to read everything sent or received, except files that have been encrypted before sending. Previously, the only practical solution was to have employees dial in to secure company phone lines for direct access to the company network. Of course, with international and long-distance phone calls, the costs quickly added up. Now, **virtual private networks (VPNs)** have solved this problem by using software to encrypt all Internet data at both ends of the transmission process. Instead of making long-distance calls, employees connect to the Internet. But, unlike typical Internet connections in which Internet data packets are unencrypted, the VPN encrypts the data sent by employees outside the company computer network, decrypts the data when they arrive within the company network, and does the same when data are sent back to the computer outside the network.

Alternatively, many companies are now adopting Web-based **secure sockets layer (SSL) encryption** to provide secure off-site access to data and programs. If you've ever entered your credit card in a Web browser to make an online purchase, you've used SSL technology to encrypt and protect that information. SSL encryption is being used if a gold lock (Internet Explorer) or a gold key (Netscape) appears along the bottom of your Web browser. SSL encryption works the same way in

the workplace. Managers and employees who aren't at the office simply connect to the Internet, open a Web browser, and then enter a user name and password to gain access to SSL encrypted data and programs. For example, the Catholic Health System of Buffalo, New York, uses an SSL system to allow radiologists to access and review medical images like X-rays from their homes. Likewise, lawyers at Sonnenschein, Nath & Rosenthal, a Chicago law firm, use the Web and their SSL encrypted system to securely access case records from anywhere in the world.⁵³ SSL encryption is cheaper than VPNs, but it typically provides only limited access to data and files. By contrast, VPN connections, though more expensive and troublesome to use, provide complete, secure access to everything on a company's network.

Finally, many companies now have wireless networks, which make it possible for anybody with a laptop and a wireless card to access the company network from anywhere in the office. Though wireless networks come equipped

with security and encryption capabilities that, in theory, permit only authorized users to access the wireless network, those capabilities are easily bypassed with the right tools. Furthermore, for ease of installation, many wireless networks are shipped with their security and encryption capabilities turned off.⁵⁴ Plus, although it's better to have it turned on than off, be wary of the WEP (Wired Equivalent Privacy) security protocol, which is easily compromised. See <http://www.wi-fi.org> for the latest information on wireless security and encryption protocols that provide much stronger protection for your company's wireless network.

Review 3: Capturing, Processing, and Protecting Information

Electronic data capture (bar codes, radio frequency identification [RFID] tags, scanners, and optical character recognition) is much faster, easier, and cheaper than manual data capture. Processing information means transforming raw data into meaningful information that can be applied to business decision making. Data mining helps managers with this transformation by discovering unknown patterns and relationships in data. Supervised data mining looks for patterns specified by managers, while unsupervised data mining looks for four general kinds of data patterns: association/affinity patterns, sequence patterns, predictive patterns, and data clusters. Protecting information ensures that data are reliably and consistently retrievable in a usable format by authorized users, but no one else. Authentication and authorization, firewalls, antivirus software for PCs and corporate email and network servers, data encryption, virtual private networks, and Web-based secure sockets layer (SSL) encryption are some of the best ways to protect information. Be careful with wireless networks, which are easily compromised even when security and encryption protocols are in place.

4 ACCESSING AND SHARING INFORMATION AND KNOWLEDGE

Simplest-shop.com sells a multitude of books, cameras, computers, DVDs, electronics, games, music, software, toys, and videos. Clicking on "DVD" brings up the 10 best-selling titles and the possibility of searching for 3,000 others. The page for each DVD (and every other product) lists customer advice, such as "recommended by 80 percent of our customers"; shares specific customer comments, such as "*Charlie and the Chocolate Factory* is a quirky but fun adaptation of Roald Dahl's classic children's tale"; and typically lists two or three different prices and places from which to order. Amazingly, with tens of thousands of products, this entire Web site and business is run by just one person, Calin Uioreanu, a software engineer from Munich, Germany. How can Uioreanu run this business by himself? He uses Web services, a growing Internet technology that allows him to tie directly into Amazon.com's back-office resources. All of the product descriptions, pictures, and customer comments and feedback ratings on Simplest-shop.com come straight from Amazon.com, which also verifies credit cards and arranges for shipping. Uioreanu uses Web services software to connect his Simplest-shop.com server to Amazon's servers for continuous information updates. The advantage for Amazon.com is that it has another Web site for selling its goods. The advantage for consumers is that they can buy many items directly from either Simplest-shop.com or Amazon.com, whichever is cheaper. The advantage for Calin Uioreanu is that he can run a huge Web business that sells over 50,000 products all by himself. According to Uioreanu, without Web services and the ability to share information from Amazon.com, "it would have been 10 times more difficult to do."⁵⁵

Today, information technologies are letting companies communicate, share, and provide data access to workers, managers, suppliers, and customers in ways that were

unthinkable just a few years ago. After reading this section, you should be able to explain how companies use information technology to improve **4.1 internal access and sharing of information**, **4.2 external access and sharing of information**, and **4.3 the sharing of knowledge and expertise**.

4.1 Internal Access and Sharing

Executives, managers, and workers inside the company use three kinds of information technology to access and share information: executive information systems, intranets, and portals. An **executive information system (EIS)** uses internal and external sources of data to provide managers and executives the information they need to monitor and analyze organizational performance.⁵⁶ The goal of an EIS is to provide accurate, complete, relevant, and timely information to managers.

Managers at Lands' End, the Web/mail-order company, use their EIS, which they call their "dashboard," to see how well the company is running. With just a few mouse clicks and basic commands such as *find*, *compare*, and *show*, the EIS displays costs, sales revenues, and other kinds of data in color-coded charts and graphs. Managers can drill down to view and compare data by region, state, time period, and product. Frank Giannantonio, Lands' End's CIO says, "Our dashboards include an early alert system that utilizes key performance metrics to target items selling faster than expected and gives our managers the ability to adjust product levels far earlier than they were able to do in the past."⁵⁷ Exhibit 17.4 describes the capabilities of two of the best-selling products that companies use for EIS programs.

Intranets are private company networks that allow employees to easily access, share, and publish information using Internet software. Intranet Web sites are just like external Web sites, but the firewall separating the internal company network from the Internet permits only authorized internal access.⁵⁸ Companies typically use intranets to share information (e.g., about benefits) and to replace paper forms with online forms. At IBM, however, the company intranet is used for electronic meetings, instant messaging, online libraries of policies and procedures, distance learning and training, online reimbursement of travel expenses, and travel schedules and reservations. As a result, 4,800 electronic meetings are held each month, one million instant message discussions are held each day, and 40 percent of company training is done online.⁵⁹ With 300,000 employees in 164 countries, the company's travel savings from online training have been huge. IBM's Jeanette Barlow says, "We saved between \$4 million and \$5 million a month not paying for travel."⁶⁰ Exhibit 17.5 further explains why companies use intranets.

Finally, corporate portals are a hybrid of executive information systems and intranets. While an EIS provides managers and executives with the information they need to monitor and analyze organizational performance, and intranets help companies distribute and publish information and forms within the company, **corporate portals** allow company managers and employees to access customized information *and* complete specialized transactions using a Web browser.⁶¹ For example, Maysteel, which makes components for electronics and electric utilities, created a corporate portal to allow plant managers at its six factories in Wisconsin and Ireland to track and enter information regarding the quality of component parts. Now, with several quick clicks via their Web browsers, each plant manager can compare costs and quality to Maysteel's other manufacturing facilities. Whereas an EIS or intranet typically can't handle transactions, a corporate portal can. Jet engine manufacturer Pratt & Whitney's corporate portal enables its engineers to track and charge their time to various projects. Previously, engineers had to be in the office directly connected to the company network to use the tracking and charging software system. Now,

executive information system (EIS)

A data processing system that uses internal and external data sources to provide the information needed to monitor and analyze organizational performance.

intranets

Private company networks that allow employees to easily access, share, and publish information using Internet software.

corporate portals

A hybrid of executive information systems and intranets that allow managers and employees to use a Web browser to gain access to customized company information and to complete specialized transactions.

EASE OF USE	<p>Few commands to learn.</p> <p>Important views saved.</p> <p>3-D charts to display data.</p> <p>Geographic dimensions.</p>	<p>Simply drag-and-drop or point-and-click to create charts and tables or get the information you need.</p> <p>Need to see weekly sales by store every Monday? Save that “view” of the data, and it will automatically be updated with new data every week.</p> <p>Column, square, pie, ring, line, area, scatter, bar, cube, etc.</p> <p>Different geographic areas are automatically color-coded for easy understanding.</p>
ANALYSIS OF INFORMATION	<p>Sales tracking.</p> <p>Easy-to-understand displays.</p> <p>Time periods.</p>	<p>Track sales performance by product, region, account, and channel.</p> <p>Information is displayed in tabular and graphical charts.</p> <p>Data can be analyzed by current year, prior year, year to date, quarter to date, and month to date.</p>
IDENTIFICATION OF PROBLEMS AND EXCEPTIONS	<p>Compare to standards.</p> <p>Trigger exceptions.</p> <p>Drill down.</p> <p>Detect & alert newspaper.</p> <p>Detect & alert robots.</p>	<p>Compares actual company performance (actual expenses versus planned expenses, or actual sales by sales quotas).</p> <p>Allows users to set triggers (5 percent over budget, 3 percent under sales quota), which then highlight negative exceptions in red and positive exceptions in green.</p> <p>Once exceptions have been identified, users can drill down for more information to determine why the exception is occurring.</p> <p>When things go wrong, the EIS delivers a “newspaper” via email to alert managers to problems. The newspaper offers an intuitive interface for easily navigating and further analyzing the alert content.</p> <p>Detect & alert robots keep an extra “eye” out for events and problems. Want to keep an eye out for news about one of your competitors? Use a news robot to track stories on Dow Jones News Retrieval. Robots can also be used to track stock quotes, internal databases, and email messages.</p>

Sources: “Business Intelligence: Overview: Enterprise Services from Pilot Software,” Accrue Software, [Online] available at http://www.pilotsw.com/Products/Accrue_Pilot_Suite/business_intelligence.html, 9 February 2002; Comshare home page, [Online] available at <http://www.comshare.com/>, February 2002.

Exhibit 17.4
 Characteristics of Best-Selling Executive Information Systems

when the engineers travel to work with customers, Pratt & Whitney’s corporate portal permits them to track and charge their time from anywhere via a Web browser.⁶²

4.2 External Access and Sharing

Historically, companies have been unable or reluctant to let outside groups have access to corporate information. Now, however, a number of information technologies—electronic data interchange, extranets, Web services, and the Internet—are making it easier to share company data with external groups like suppliers and customers. They’re also reducing costs, increasing productivity by eliminating manual information processing (70 percent of the data output from one company, like a purchase order, ends up as data input at another company, such as a sales invoice or shipping order), reducing data entry errors, improving customer service, and speeding communications. As a result, managers are scrambling to adopt these technologies.

With **electronic data interchange**, or EDI, two companies convert purchase and ordering information to a standardized format to enable direct electronic

electronic data interchange (EDI)

When two companies convert their purchase and ordering information to a standardized format to enable the direct electronic transmission of that information from one company’s computer system to the other company’s computer system.

- Intranets are inexpensive.
- Intranets increase efficiencies and reduce costs.
- Intranets are intuitive and easy to use (Web-based).
- Intranets work across all computer systems and platforms (Web-based).
- Intranets can be built on top of an existing computer network.
- Intranets work with software programs that easily convert electronic documents to HTML files for intranet use.
- Much of the software required to set up an intranet is either freeware (no cost) or shareware (try before you buy, usually less expensive than commercial software).

Exhibit 17-5

Why Companies Use Intranets

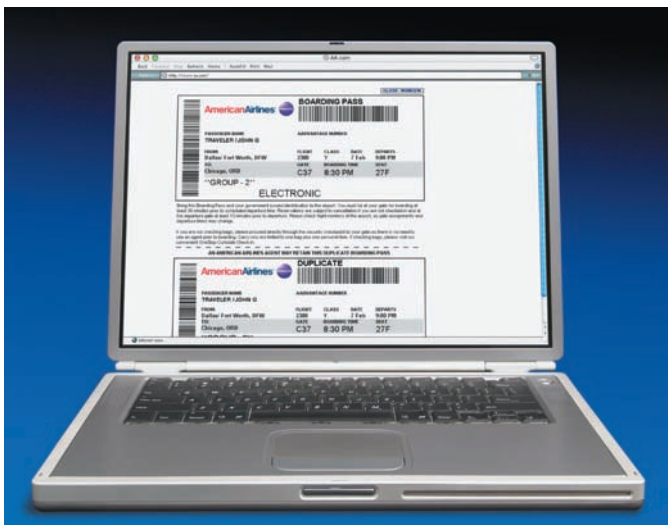
Web services

Using standardized protocols to describe data from one company in such a way that those data can automatically be read, understood, transcribed, and processed by different computer systems in another company.

extranet

Networks that allow companies to exchange information and conduct transactions with outsiders by providing them with direct, Web-based access to authorized parts of a company's intranet or information system.

RFID technology is in use at this Carrollton, Texas loading dock. Boxes equipped with RFID tags speed along a conveyor belt and are recorded by the computer workstation. The system eliminates the need for workers to scan every box with a handheld device and so is more accurate.



COURTESY OF AMERICAN AIRLINES, INC.

transmission of that information from one company's computer system to the other company's system. For example, when a Wal-Mart checkout clerk drags a CD across the checkout scanner, Wal-Mart's computerized inventory system automatically reorders another copy of that CD through the direct EDI connection that its computer has with the manufacturing and shipping computer at the company that published the CD, say, Atlantic Records. No one at Wal-Mart or Atlantic Records fills out paperwork. No one makes phone calls. There are no delays to wait to find out whether Atlantic has the CD in stock. The transaction takes place instantly and automatically because the data from both companies were translated into a standardized, shareable, compatible format.

“Web services” are another way for companies to directly and automatically transmit purchase and ordering information from one company's computer systems to another company's computer systems. **Web services** use standardized protocols to describe and transfer data from one company in such a way that those data can automatically be read, understood, transcribed, and processed by different computer systems in another company.⁶³ For instance, Route One is a company that was started by the financing companies of DaimlerChrysler, Ford, General Motors, and Toyota. Not surprisingly, each auto company has a different computer system with different operating systems, different programs, and different data structures. Route One relies on Web services to connect these different computer systems to the wide variety of different databases and software used by various auto dealers, credit bureaus, banks, and other auto financing companies. Without Web services, there's no way these different companies and systems could share information. In short, says Kelly Schmitz, IT director for biotech company Cubist Pharmaceuticals, “Web services can tie together applications that were never made to interact with each other.”⁶⁴

Now, what's the difference between Web services and EDI? For EDI to work, the data in different companies' computer, database, and network systems must adhere to a particular set of standards for data structure and processing. For example, company X, which has a 7-digit parts numbering system, and company Y, which has an 8-digit parts numbering system, would agree to convert their internal parts numbering systems to identical 10-digit parts numbers when their computer systems talk to each other. By contrast, the tools underlying

Web services, such as extensible markup language, or XML (don't worry if you don't how this works, just appreciate what it does), automatically do the describing and transcribing so that data with different structures can be shared across very different computer systems in different companies. As a result, Web services allow organizations to communicate data without special knowledge of each other's computer information systems by automatically handling those differences.

In EDI and Web services, the different purchasing and ordering applications in each company interact automatically without any human input. No one has to lift a finger to click a mouse, enter data, or hit the “return” key. An **extranet**, by contrast, allows companies to exchange information and conduct transactions by purposely providing outsiders with direct, Web browser-based access

to authorized parts of a company's intranet or information system. Typically, user names and passwords are required to access an extranet.⁶⁵ For example, to make sure that its distribution trucks don't waste money by running half empty (or make late deliveries to customers because it waited to ship until the trucks were full), General Mills uses an extranet to provide Web-based access to its trucking database to 20 other companies that ship their products over similar distribution routes. When other companies are ready to ship products, they log on to General Mills' trucking database, check the availability, and then enter the shipping load, place, and pickup time. Thus, by sharing shipping capacity on its trucks, General Mills can run its trucks fully loaded all the time. In several test areas, General Mills saved 7 percent on shipping costs, or nearly \$2 million in the first year. Expanding the program company-wide is producing even larger cost savings.⁶⁶

Finally, similar to the way in which extranets are used to handle transactions with suppliers and distributors, companies are reducing paperwork and manual information processing by using the Internet to electronically automate transactions with customers. For example, most airlines have automated the ticketing process by eliminating paper tickets altogether. Simply buy an e-ticket via the Internet and then check yourself in at the airport using your credit card and an automated kiosk that prints out your boarding pass and your luggage tags. Together, Internet purchases, ticketless travel, and automated check-ins have fully automated the purchase of airline tickets. And, by eliminating the costs of recording, printing, handling, and mailing tickets, the commission that would have been paid to travel agents, and the hourly wages and benefits paid to check-in clerks, the airlines save an estimated \$30 to \$40 per ticket.⁶⁷

In the long run, the goal is to link customer Internet sites with company intranets (or EDI) and extranets so that everyone—all the employees and managers within a company, and the suppliers and distributors outside the company—who is involved in providing a service or making a product for a customer is automatically notified when a purchase is made. Companies that use EDI, Web services, extranets, and the Internet to share data with customers and suppliers achieve increases in productivity 2.7 times larger than those that don't.⁶⁸

4.3 Sharing Knowledge and Expertise

At the beginning of the chapter, we distinguished between raw data, which consist of facts and figures, and information, which consists of useful data that influence someone's choices and behavior. One more important distinction needs to be made, namely, that data and information are not the same as knowledge. **Knowledge** is the understanding that one gains from information. Importantly, knowledge does not reside in information. Knowledge resides in people. That's why companies hire consultants or why family doctors refer patients to specialists. Unfortunately, it can be quite expensive to employ consultants, specialists, and experts. So companies have begun using two information technologies, decision support systems and expert systems, to capture and share the knowledge of consultants, specialists, and experts with other managers and workers.

Whereas an executive information system speeds up and simplifies the acquisition of information, a **decision support system (DSS)** helps managers understand problems and potential solutions by acquiring and analyzing information with sophisticated models and tools.⁶⁹ Furthermore, whereas EIS programs are broad in scope and permit managers to retrieve all kinds of information about a company, DSS programs are usually narrow in scope and targeted toward helping managers solve specific kinds of problems. DSS programs have been developed to help managers pick the shortest and most efficient routes for delivery trucks, select the best combination of stocks for investors, and schedule the flow of inventory through complex manufacturing facilities.

knowledge

The understanding that one gains from information.

decision support system (DSS)

An information system that helps managers understand specific kinds of problems and potential solutions and analyze the impact of different decision options using "what if" scenarios.

It's important to understand that DSS programs don't replace managerial decision making; they improve it by furthering managers' and workers' understanding of the problems they face and the solutions that might work. For example, Apache Medical Systems (now owned by Cerner Corporation) makes a DSS for emergency room physicians.⁷⁰ Apache's DSS collects data on 17 different physiological signs, such as blood pressure, respiratory rate, temperature, and white blood count. Then, using a database containing the medical records of more than 400,000 people (with 100 diseases) who received treatment at more than 200 different emergency rooms, the DSS gives a diagnosis and rates the chances of the patient's survival using various treatments. Apache's DSS helps physicians pose and answer "what if" questions by processing the latest information about a patient's health status three times a day and then printing out an unbiased, statistically based estimate of whether a given treatment is working. For example, if a nurse receives two printouts, one in the morning and another in the afternoon, indicating that a patient's chances of survival have dropped from 75 percent to 55 percent, the nurse has a very good reason to contact the doctor to reconsider the treatment. Not only is Apache helping doctors save lives, but it is also giving doctors the confidence to move patients out of intensive care earlier. With intensive care costs running about \$5,000 a day, Apache helped the Dominican Hospital in Santa Cruz, California, save \$2.8 million a year in unnecessary treatments.⁷¹

expert system

An information system that contains the specialized knowledge and decision rules used by experts and experienced decision makers so that nonexperts can draw on this knowledge base to make decisions.

Expert systems are created by capturing the specialized knowledge and decision rules used by experts and experienced decision makers. They permit non-expert employees to draw on this expert knowledge base to make decisions. Most expert systems work by using a collection of "if-then" rules to sort through information and recommend a course of action. For example, let's say that you're using your American Express card to help your spouse celebrate a promotion. After dinner and a movie, you and your spouse stroll by a travel office with a Las Vegas poster in its window. Thirty minutes later, caught up in the moment, you find yourselves at the airport ticket counter trying to purchase last-minute tickets to Vegas. But there's just one problem. American Express didn't approve your purchase. In fact, the ticket counter agent is now on the phone with an American Express customer service agent.

So what put a temporary halt to your weekend escape to Vegas? An expert system that American Express calls "Authorizer's Assistant."⁷² The first "if-then" rule that prevented your purchase was the rule "if a purchase is much larger than the cardholder's regular spending habits, then deny approval of the purchase." This if-then rule, just one of 3,000, is built into American Express's transaction-processing system that handles thousands of purchase requests per second. Now that the American Express customer service agent is on the line, he or she is prompted by the Authorizer's Assistant to ask the ticket counter agent to examine your identification. You hand over your driver's license and another credit card to prove you're you. Then the ticket agent asks for your address, phone number, Social Security number, and your mother's maiden name and relays the information to American Express. Finally, your ticket purchase is approved. Why? Because you met the last series of "if-then" rules. *If* the purchaser can provide proof of identity and *if* the purchaser can provide personal information that isn't common knowledge, *then* approve the purchase.

Review 4: Accessing and Sharing Information and Knowledge

Executive information systems, intranets, and corporate portals facilitate internal sharing and access to company information and transactions. Electronic data interchange, Web services, and the Internet allow external groups, like suppliers and customers, to easily access company information. All three decrease costs by reducing or eliminating data entry, data errors, and paperwork, and by speeding up communication. Organizations use decision support systems and expert systems to capture and share specialized knowledge with nonexpert employees.

Key Terms

- acquisition cost, 559
- association/affinity patterns, 563
- authentication, 566
- authorization, 566
- bar code, 562
- biometrics, 567
- communication cost, 560
- corporate portals, 570
- data clusters, 564
- data encryption, 567
- data mining, 563
- data warehouse, 563
- decision support system (DSS), 573
- electronic data interchange (EDI), 571
- electronic scanner, 562
- executive information system (EIS), 570
- expert system, 574
- extranet, 572
- firewall, 567
- first-mover advantage, 555
- information, 555
- intranets, 570
- knowledge, 573
- Moore's law, 554
- optical character recognition, 562
- predictive patterns, 564
- processing cost, 559
- processing information, 562
- protecting information, 564
- radio frequency identification (RFID) tags, 562
- raw data, 555
- retrieval cost, 560
- secure sockets layer (SSL) encryption, 568
- sequence patterns, 563
- storage cost, 559
- supervised data mining, 563
- two-factor authentication, 566
- unsupervised data mining, 563
- virtual private network (VPN), 568
- virus, 567
- Web services, 572

Concept Check

1. What is the difference between data and information? Why is the distinction important?
2. Discuss the strategic importance of information.
3. Identify and describe the characteristics and costs of useful information.
4. How do companies capture information?
5. Describe ways that managers can process the information they collect.
6. What kinds of security threats to information do managers contend with routinely?
7. How do managers protect their information?
8. How can companies use information technology to improve access to and sharing of information within the organization itself?
9. How can companies use information technology to improve access to and sharing of information with external organizations (e.g., customers, suppliers, etc.)?
10. What is knowledge, and how can it be shared throughout an organization?

Self-Assessment

COMPUTER COMFORT

Computers are ubiquitous in modern society, but that does not mean that everyone embraces them. As with any innovation, some people are reluctant to adopt computer technology for whatever reason. How comfortable are you with computer technology? The

Self-Assessment Appendix has a survey designed to reveal how anxious or confident you are with computers. Wherever you fall on the spectrum, you can use the results as a baseline for developing (or enhancing) your computer skills. Turn to page 624 and get started!

Management Decision

CAN YOU SEE IT NOW?

After a long weekend working with your information technology team, you are confident that the company's server is thoroughly protected from outside attacks.⁷³ You and your team spent months planning and four days working around the clock to update the IT system, install firewalls, and load SSL into the company's e-commerce tools, just to name a few of the security measures you upgraded. Now your company's information is protected with the latest and greatest.

When you stumble back to work on Wednesday, you follow your familiar route through the marketing department. Turning a corner, you overhear a junior marketing employee talking on her cell phone. She's saying, "I'm soooooo far behind. No, really, I am. Check it out." Then she lifts her cell phone in the air and begins taking pictures of her desk.

Suddenly, you've lost your mission-accomplished swagger. Your team just spent thousands of labor hours protecting the company's digital assets, but anybody with a camera phone can take pictures of printouts, office layouts, client lists, accounting reports, marketing strategies, trade secrets—anything. A cell phone is the telecommunication version of a Swiss army knife: a versatile tool with potentially dangerous capabilities. Most cell phones have large memories for storing images, and what's more, they have GPRS technology to connect them wirelessly to the Internet. Someone could take a picture of sensitive information,

and in seconds, it could travel around the world and land on a competitor's computer (or cell phone, for that matter).

Camera-equipped cell phones are quickly becoming the norm. The market for the hybrid phones grew 200 percent in 2004, and researchers estimate that by 2008, 68 percent of all cell phones will be equipped with cameras and video capabilities—and the memory necessary to drive them.

Your pace quickens. You stop at your office to ditch your briefcase and then head straight to the CEO. Halfway there, however, you realize you need to be more composed before sounding alarm bells. Returning to your office, you fire up your computer and begin working on a memo.

Questions

1. What areas of a company are most likely to be compromised by the presence of camera phones?
2. Besides cell phones, can you think of other personal items that represent threats to a company's information, digital or otherwise? What are they? Should companies be able to restrict such items in the workplace?
3. How could camera phones *improve* the collection and dissemination of information in a company?
4. Do you recommend banning camera phones in the workplace? Why or why not? Write a brief memo to the CEO explaining your position.

Management Team Decision

YOU SAVED \$9.32!

The numbers are staggering: more than 12,000 U.S. supermarkets offer some kind of shopper card or customer reward program, already covering over 50 percent of the grocery market, and the trend is on the upswing.⁷⁴ Since their inception, shopper card programs have largely been confined to offering cents-off discounts to customers who join. The birth of the shopper card was a move by supermarkets to slow the intrusion of the likes of Wal-Mart and Target into the nearly \$400 billion grocery industry. Supermarkets often operate on razor-thin margins (think low single digits) and are no match for the purchasing power of big discount chains.

To keep customers from defecting to Wal-Mart Supercenters, Super Targets, and Meijer, traditional supermarkets use shopper card loyalty programs to collect data on customers and their purchases. When a customer signs up, he or she gives basic demographic data: name, address, phone number, maybe even income and a credit card number. Once the customer starts reaping the benefits of the card, (i.e., discounts), the supermarket begins collecting data about how he or she spends money in the store, what brands are bought, how often, in what size, and so forth. By tracking customer spending habits, supermarkets have the data they need to send coupons for products a customer buys just about the time the customer is ready to buy them. Stores also

know how to target their coupons. In other words, they do not send coupons for cat food to a customer who has only bought dog food in the past. Sending coupons in the mail and giving in-store discounts to shopper-card-carrying customers are the basic ways of creating customer loyalty programs.

Simple shopper card programs are expanding into areas beyond the grocery. For example, some stores work with major airlines to offer frequent-flier miles for every dollar spent at the grocery. Other stores have clubs designed around various interests: Winn Dixie has a Baby Club for new parents, a Wine Club for wine enthusiasts, and a Pet Club for animal owners. Each club produces a newsletter on the topic of interest, sends coupons and notices for in-store promotions, and some even give \$10-off coupons after you have spent \$200 in the store on items associated with the club (like diapers and formula for the Baby Club). One successful program, Greenpoints, allows shoppers to collect points with every purchase and redeem them for merchandise or cash back. Greenpoints even lets you transfer your points to your local school so that it can buy supplies, from paper and pens to computers.

Although shopper cards enable stores to collect hoards of data, they are not without drawbacks. Many independent organizations and journalists have shown that the regular price of an item is offered to cardholders as the discounted price. If you don't have a card, you can pay 30 percent over the regular retail price of the item. Backlash against the collection of consumer information is also building, as stores become more creative and assertive about amassing customer data. (Safeway has launched computerized carts that use wireless technology to track where you are in the store and offer you discounts depending on what product you're looking at.) And people who buy more, save more, which means that lower-income shoppers will not spend enough to show up on the radar for frequent-user discounts. But perhaps the biggest drawback is the cost. Expensive computer technology is needed to automate discounting and to warehouse and sort data; special bulk mailings to residential addresses cost more than newspaper inserts; maintaining and managing extensive programs takes time and personnel. Plus, stores have typically not been able to convert their masses of data into useful information. One researcher estimates that fewer than 30 percent of stores know how to effectively use the data they collect and that less than

10 percent are able to use the data strategically to set prices. Most of the grocery industry has not committed to using the loyalty card data, so programs have become nothing more than electronic coupons.

Nonetheless, shopper card programs are still on an upward trend. At the very least, they help grocers analyze purchasing trends at individual stores, and with profit margins typically under 5 percent, that can mean a lot. In a world of supercenters, grocers need a tool to make intelligent decisions so that they can survive. And to make those decisions, supermarkets need good information. Still, not all stores have a shopper card program.

For this management team decision, your team will be acting as the management team of a small chain of independent supermarkets that does not yet have a shopper card program. You will decide whether to follow the rising tide and implement a shopper card program. Your team will need to consider the types of data to collect, the cost of collection (you don't need hard figures here), and the cost of converting the data to information, among other things.

Questions

1. As a team, brainstorm several ways that you can capture data about your customers. How will you turn the data you collect into useful, valuable information? (*Hint:* Remember that information is only useful when it is accurate, complete, relevant, and timely.)
2. Identify monetary and nonmonetary costs of collecting the information. Are there costs (or risks) to not collecting customer data?
3. Since you will not be the first supermarket to implement a shopper card or loyalty program, how can you create a competitive advantage by adding one? In other words, how can you use a shopper card program to continuously improve and support the core functions of the supermarket? (Think along the lines of increasing store traffic, managing inventory, and so forth.)
4. Based on the exploratory work you have done, do you adopt a loyalty card program at your small chain of supermarkets? Explain your decision.
5. *Optional:* Using the information from Chapter 5 on planning, write a plan for implementing a shopper card/loyalty program at your supermarket network.

Develop Your Career Potential

LEARN TO TALK TECH

Most people are intimidated by technology. But like many things, technology becomes easier if you familiarize yourself with the basics. One way to learn to “speak like a geek” is to subscribe to PC Magazine, the premier magazine about personal computing. Depending on your budget, it may be more feasible (and possibly more productive) if you spend a set amount of time each week perusing the periodical section of the library and flipping through a selection of magazines dedicated to technology. The important thing is to be patient, however. After several months, you should begin to understand what they’re talking about. After that, it’s easy to stay current. Sign up at <http://pcmag.com>. You can also sign up for the “Term of the Day” email newsletter at <http://webopedia.com>. Each day, Webopedia emails you a new technology term and its definition. Either way, you’ll soon be able to talk tech.

Why is talking tech so important? Information technology (IT) is an integral part of nearly every business, whether it’s simple email applications or more complex networking, e-commerce, and operations software. Very few companies are able to get by without using IT regularly. This being the case, managers need to understand this critical component of their companies’ operations. That’s not to say that managers (other than IT managers, of course) need to know every last technical detail, but as a manager, you will need—and want—to know what your tech staff is talking about when they bring problems, concerns, or suggestions for improvement to your office.

Computers are becoming an integral part of all kinds of work, so you need to do more than just

understand the terminology, however. You also need to be able to use technology effectively. The reason is that people with basic computer skills earn 15 to 30 percent higher lifetime incomes than those without them. What should you do to learn about computers? Subscribe to *PC Magazine*, *PC World*, or *Mac World*. Buy a book about Microsoft Office and then take tests to be Microsoft Office User certified (see the Microsoft Web site for more information) in Word, Excel, PowerPoint, or Access. Take more than the required computer classes for your degree. Unless you want less job security and earning power, start learning more about computers today.

Activities

1. If you are completely new to IT, you might be more comfortable reading about it in the context of your favorite business publication. Walter Mossberg has a regular technology column in the *Wall Street Journal*, and Peter Lewis has a column titled “Gadgets,” which can always be found in the so-called First section of *Fortune* magazine. Articles in both publications are on the shorter side, so take an hour and read through a few weeks’ worth of each.
2. The U.S. government operates a technology Web site at <http://www.technology.gov>. Go there to download a report published in June 2003 on technology training opportunities (there may even be a more recent one). The table of contents alone will give you a wealth of ideas about where and what kind of IT training you may want to pursue in conjunction with your business degree.



Biz Flix *Lorenzo's Oil*

This film tells the true story of young Lorenzo Odone who suffers from adrenoleukodystrophy (ALD), an incurable degenerative brain disorder. (Six actors and actresses play Lorenzo throughout the film.) Physicians and medical scientists offer little help to Lorenzo's desperate parents, Michaela (Susan Sarandon) and Augusto (Nick Nolte). They use their resources to learn about ALD to try to save their son. Director George Miller cowrote the script, which benefited from his medical training as a physician.

Six months after Lorenzo's ALD diagnosis, his condition fails to improve with a restricted diet. Michaela and Augusto continue their research at the National Institutes of Health library in Bethesda, Maryland. Michaela finds a report of a critical Polish experiment that showed positive effects of fatty acid manipulation in rats. Convinced that a panel of experts could systematically focus on their problem, they help organize the First International ALD Symposium. This scene is an edited version of the symposium sequence that appears about midway through the film. The film continues with the Odone's efforts to save their son.

What to Watch for and Ask Yourself

1. Do the scientists present data or information during the symposium?
2. If it is information, who transformed the data into information? Speculate about how such data become information.
3. What do you predict will be the next course of action for the Odone's?



Management Workplace Data Management

Have you ever thought of data as money? Probably not in your personal life, but in business, information has a cost and therefore a related value. Businesses across the world that rely heavily on computer technology understand the value of their data and implement ways to protect their data and data networks from theft, damage, or incompetence. Still, it is easy to be lulled into overconfidence (or sheer laziness) when it comes to computer upgrades or simple virus protection. Nevertheless, data management should be a priority for all companies. In this video, managers from some of the largest names in data protection (Symantec, TrendMicro, McAfee) talk about the threats to data and data networks and the ways you can safeguard your computer against attacks

What to Watch for and Ask Yourself

1. According to the video, are upgrades really necessary?
2. Describe the nature of data protection.
3. Explain the paradox of ubiquitous computing described in the video. That is, how has the pervasiveness of computer technology made our lives easier and more difficult at the same time?

Take Two