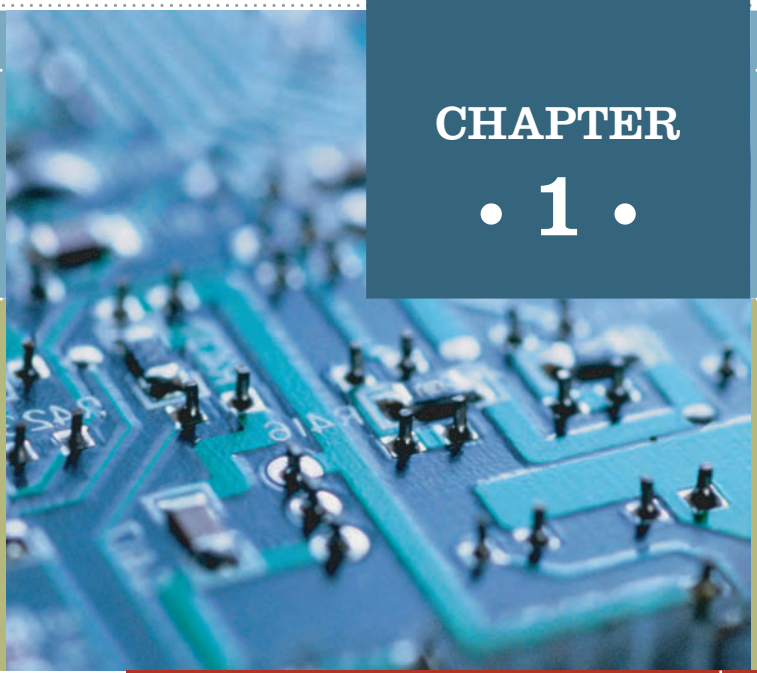
PART

1

Information Systems in Perspective



CHAPTER

• 1 •

An Introduction to Information Systems in Organizations

PRINCIPLES	LEARNING OBJECTIVES
▪ **The value of information is directly linked to how it helps decision makers achieve the organization's goals.**	▪ Distinguish data from information and describe the characteristics used to evaluate the quality of data.
▪ **Knowing the potential impact of information systems and having the ability to put this knowledge to work can result in a successful personal career, organizations that reach their goals, and a society with a higher quality of life.**	▪ Identify the basic types of business information systems and discuss who uses them, how they are used, and what kinds of benefits they deliver.
▪ **System users, business managers, and information systems professionals must work together to build a successful information system.**	▪ Identify the major steps of the systems development process and state the goal of each.
▪ **The use of information systems to add value to the organization can also give an organization a competitive advantage.**	▪ Identify the value-added processes in the supply chain and describe the role of information systems within them. ▪ Identify some of the strategies employed to lower costs or improve service. ▪ Define the term *competitive advantage* and discuss how organizations are using information systems to gain such an advantage.
▪ **Information systems personnel are the key to unlocking the potential of any new or modified system.**	▪ Define the types of roles, functions, and careers available in information systems.

INFORMATION SYSTEMS IN THE GLOBAL ECONOMY
BOEHRINGER INGELHEIM, GMBH, GERMANY

Lean and Mean with Information Systems

Boehringer Ingelheim is among the world's 20 largest pharmaceutical companies. A giant company with $7.6 billion in revenues and 32,000 employees in 60 nations, Boehringer has diversified into segments that include manufacturing and marketing pharmaceuticals (such as prescription medicines and consumer healthcare products), products for industrial customers (such as chemicals and biopharmaceuticals), and animal health products.

The sheer size of the company was slowing the flow of information to decision makers in the organization. "I want to be told where I stand and where we are heading," says Holger Huels, chief financial officer, "I like to [be able to] see negative trends and counter them as fast as possible." With each of the company's segments using diverse information systems, it took a significant amount of time to collect and combine all of the financial records. Each month, the accounting department would spend three days collecting and analyzing printed reports to create the company's monthly report.

Top managers decided to totally revamp the company's systems with state-of-the-art information systems from SAP, the world's largest enterprise software company. It took 14 months to roll out the new system, and many employees needed intensive training. In the end, the results were well worth the investment in time and money. The software provided a standard system used across all of Boehringer's business segments and offered convenient Web access to current information. Boehringer is now able to complete monthly reports just two hours after the close of business at the end of each month. The new system has made the accounting department much more productive, allowing staff to run up-to-date reports whenever needed.

Boehringer is committed to providing all employees with the applications and information they need. About one-third of Boehringer's employees work outside the office. To provide its mobile workforce with up-to-the-minute data, the company deployed software from BackWeb Technologies, which allows access to current sales information through a Web portal and a custom Web interface. With the new system, Boehringer's employees can access and change information presented in the portal when they are offline, with updates later when they log on.

By the time Boehringer was finished with its technology makeover, the company had implemented over seven new interconnected information systems and invested millions in hardware, software, databases, telecommunications, and training. But the investment has paid off. Employees can now access up-to-date organization-wide information, wherever they may be, with the click of a mouse. And decision makers can react as nimbly and quickly to changes as many of Boehringer's smaller competitors.

As you read this chapter, consider the following:

- In designing its new information systems, what do you think were Boehringer's most critical goals and considerations?
- How are hardware, software, databases, telecommunications, people, and procedures used in Boehringer's information system to provide valuable data?

Why Learn About Information Systems in Organizations?

Information systems are used in almost every imaginable career area. A management major might be hired to work with computerized employee files and records for a shipping company. A marketing major might work for a large retail store analyzing customer needs with a computer. An accounting major might work for an accounting or consulting firm using a computer to audit other companies' financial records. A real estate major might use the Internet and work within a loose organizational structure with clients, builders, and a legal team located around the world. Regardless of your college major or chosen career, you will find that information systems are indispensable tools to help you achieve your career aspirations. Learning about information systems can help you get your first job, obtain promotions, and advance your career. Why learn about information systems? What is in it for you? Learning about information systems will help you achieve your goals! Let's get started by exploring the basics of information systems.

information system (IS)
A set of interrelated components that collect, manipulate, and disseminate data and information and provide a feedback mechanism to meet an objective.

An **information system (IS)** is a set of interrelated components that collect, manipulate, store, and disseminate data and information and provide a feedback mechanism to meet an objective. The feedback mechanism helps organizations achieve their goals, such as increasing profits or improving customer service.

Information systems are everywhere. A customer at the gas pump waves a keychain tag at a reader that sends the information to a network to verify the customer's profile and credit information. The terminal processes the transaction, prints a receipt, and the customer's credit/check card is automatically billed.

(Source: Courtesy of Texas Instrument Inc. All Rights Reserved.)

Computers and information systems are constantly changing the way organizations conduct business. They are becoming fully integrated into our lives, businesses, and society. They can help organizations carry on daily operations (operational systems). For example, Wal-Mart uses operational systems to pull supplies from distribution centers and, ultimately, suppliers, to stock shelves, and to push out products and services through customer purchases. Computer and information systems also act as command and control systems that monitor processes and help supervisors control them. For example, air traffic control centers use computers and information systems as command and control centers to monitor and direct planes in their airspace.

Computers and information systems will continue to change our society, our businesses, and our lives. In this chapter, we present a framework for understanding computers and information systems and discuss why it is important to study information systems. This understanding will help you unlock the potential of properly applied IS concepts. We begin with information concepts.

INFORMATION CONCEPTS

Information is a central concept throughout this book. The term is used in the title of the book, in this section, and in almost every chapter. To be an effective manager in any area of business, you need to understand that information is one of an organization's most valuable and important resources. This term, however, is often confused with the term *data*.

data
The raw facts, such as an employee's name and number of hours worked in a week, inventory part numbers, or sales orders.

Data Versus Information

Data consists of raw facts, such as an employee's name and number of hours worked in a week, inventory part numbers, or sales orders. As shown in Table 1.1, several types of data can be used to represent these facts. When these facts are organized or arranged

in a meaningful manner, they become information. **Information** is a collection of facts organized in such a way that they have additional value beyond the value of the facts themselves. For example, a particular manager might find the knowledge of total monthly sales to be more suited to his or her purpose (i.e., more valuable) than the number of sales for individual sales representatives. Providing information to customers can also help companies increase revenues and profits.

information
A collection of facts organized in such a way that they have additional value beyond the value of the facts themselves.

Table 1.1
Types of Data

Data	Represented By
Alphanumeric data	Numbers, letters, and other characters
Image data	Graphic images and pictures
Audio data	Sound, noise, or tones
Video data	Moving images or pictures

Data represents real-world things. As we have stated, data—simply raw facts—has little value beyond its existence. For example, consider data as pieces of railroad track in a model railroad kit. In this state, each piece of track has little value beyond its inherent value as a single object. However, if some relationship is defined among the pieces of the track, they will gain value. By arranging the pieces of track in a certain way, a railroad layout begins to emerge (Figure 1.1a). Information is much the same. Rules and relationships can be set up to organize data into useful, valuable information.

The type of information created depends on the relationships defined among existing data. For example, the pieces of track could be rearranged to form different layouts (Figure 1.1b). Adding new or different data means relationships can be redefined and new information can be created. For instance, adding new pieces to the track can greatly increase the value—in this case, variety and fun—of the final product. We can now create a more elaborate railroad layout (Figure 1.1c). Likewise, our manager could add specific product data to his or her sales data to create monthly sales information broken down by product line. This information could be used by the manager to determine which product lines are the most popular and profitable.

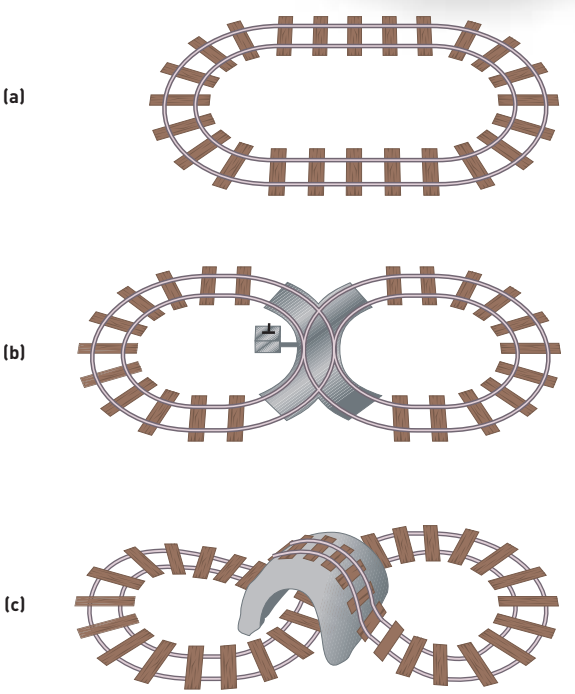


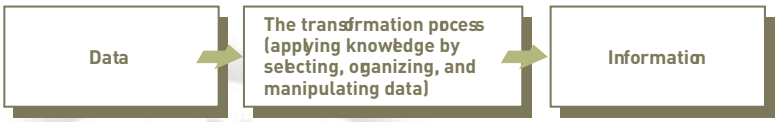
Figure 1.1
Defining and Organizing Relationships Among Data Creates Information

process
A set of logically related tasks performed to achieve a desired outcome.

knowledge
The awareness and understanding of a set of information and the ways it can be used.

Turning data into information is a **process**, or a set of logically related tasks performed to achieve a defined outcome. The process of defining relationships among data to create useful information requires knowledge. **Knowledge** is an awareness and understanding of a set of information and the ways that information can be used to support a specific task or reach a decision. Part of the knowledge needed for building a railroad layout, for instance, is understanding how large an area is available for the layout, how many trains will run on the track, and how fast they will travel. The act of selecting or rejecting facts based on their relevancy to particular tasks is also based on a type of knowledge used in the process of converting data into information. Therefore, information can be considered data made more useful through the application of knowledge. In some cases, data is organized or processed mentally or manually. In other cases, a computer is used. In the earlier example, the manager could have manually calculated the sum of the sales of each representative, or a computer could calculate this sum. What is important is not so much where the data comes from or how it is processed but whether the results are useful and valuable. This transformation process is shown in Figure 1.2.

Figure 1.2
The Process of Transforming Data into Information



The Characteristics of Valuable Information

To be valuable to managers and decision makers, information should have the characteristics described in Table 1.2. These characteristics also make the information more valuable to an organization. Many organizations and shipping companies, for example, are able to determine the exact location of inventory items and packages in their systems. Recently, the U.S. Army Materiel Command tagged all its cargo and food shipments with radio-frequency identification chips for shipment to the Middle East. Because of the easy electronic retrieval of information from the tags, the time needed to take inventory of the cargo when it arrived was reduced from the usual 2 to 3 days to just 22 minutes.[1]

The Value of Information

The value of information is directly linked to how it helps decision makers achieve their organization's goals. For example, the value of information might be measured in the time required to make a decision or in increased profits to the company. Consider a market forecast that predicts high demand for a new product. If market forecast information is used to develop the new product and the company is able to make an additional profit of $10,000, the value of this information to the company is $10,000 minus the cost of the information. Valuable information can also help managers decide whether to invest in additional information systems and technology. A new computerized ordering system might cost $30,000, but it might generate an additional $50,000 in sales. The *value added* by the new system is the additional revenue from the increased sales of $20,000. Most corporations have cost reduction as a primary goal. Using information systems, some manufacturing companies have been able to slash inventory costs by millions of dollars.

WHAT IS AN INFORMATION SYSTEM?

As mentioned previously, an information system (IS) is a set of interrelated elements or components that collect (input), manipulate (process) and store, and disseminate (output) data and information and provide a feedback mechanism to meet an objective (see Figure 1.3). The feedback mechanism helps organizations achieve their goals, such as increasing profits or improving customer service.

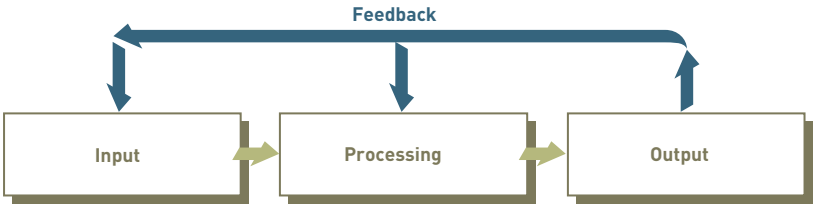


Figure 1.3

The Components of an Information System

Feedback is critical to the successful operation of a system.

Characteristics	Definitions
Accurate	Accurate information is error free. In some cases, inaccurate information is generated because inaccurate data is fed into the transformation process (this is commonly called garbage in, garbage out [GIGO]).
Complete	Complete information contains all the important facts. For example, an investment report that does not include all important costs is not complete.
Economical	Information should also be relatively economical to produce. Decision makers must always balance the value of information with the cost of producing it.
Flexible	Flexible information can be used for a variety of purposes. For example, information on how much inventory is on hand for a particular part can be used by a sales representative in closing a sale, by a production manager to determine whether more inventory is needed, and by a financial executive to determine the total value the company has invested in inventory.
Reliable	Reliable information can be depended on. In many cases, the reliability of the information depends on the reliability of the data collection method. In other instances, reliability depends on the source of the information. A rumor from an unknown source that oil prices might go up may not be reliable.
Relevant	Relevant information is important to the decision maker. Information that lumber prices might drop may not be relevant to a computer chip manufacturer.
Simple	Information should also be simple, not overly complex. Sophisticated and detailed information may not be needed. In fact, too much information can cause information overload, whereby a decision maker has too much information and is unable to determine what is really important.
Timely	Timely information is delivered when it is needed. Knowing last week's weather conditions will not help when trying to decide what coat to wear today.
Verifiable	Information should be verifiable. This means that you can check it to make sure it is correct, perhaps by checking many sources for the same information.
Accessible	Information should be easily accessible by authorized users to be obtained in the right format and at the right time to meet their needs.
Secure	Information should be secure from access by unauthorized users.

Table 1.2

Characteristics of Valuable Information

Input, Processing, Output, and Feedback

Input

In information systems, **input** is the activity of gathering and capturing raw data. In producing paychecks, for example, the number of hours every employee works must be collected before paychecks can be calculated or printed. In a university grading system, individual instructors must submit student grades before a summary of grades for the semester or quarter can be compiled and sent to the students.

input
The activity of gathering and capturing raw data.

Input can be a manual or an automated process. A scanner at a grocery store that reads bar codes and enters the grocery item and price into a computerized cash register is a type of automated input process. Regardless of the input method, accurate input is critical to achieve the desired output.

Processing

processing
The activity of converting or transforming data into useful outputs.

In information systems, **processing** involves converting or transforming data into useful outputs. Processing can involve making calculations, making comparisons and taking alternative actions, and storing data for future use. Processing data into useful information is critical in business settings.

Processing can also be done manually or with computer assistance. In the payroll application, each employee's number of hours worked must be converted into net, or take-home, pay. Other inputs often include employee ID number and department. The required processing first involves multiplying the number of hours worked by the employee's hourly pay rate to get gross pay. If weekly hours worked exceed 40 hours, overtime pay might also be included. Then, deductions—for example, federal and state taxes, and contributions to health and life insurance or savings plans—are subtracted from gross pay to obtain net pay.

After these calculations and comparisons are performed, the results are typically stored. *Storage* involves keeping data and information available for future use, including output, discussed next.

Output

output
The production of useful information, usually in the form of documents and reports.

In information systems, **output** involves producing useful information, usually in the form of documents and reports. Outputs can include paychecks for employees, reports for managers, and information supplied to stockholders, banks, government agencies, and other groups. In some cases, output from one system can become input for another. For example, output from a system that processes sales orders can be used as input to a customer billing system. Often, output from one system can be used as input to control other systems or devices. For instance, the design and manufacture of office furniture is complicated with many variables. The salesperson, customer, and furniture designer can go through several design iterations to meet the customer's needs. Special computer programs and equipment create the original design and allow the designer to rapidly revise it. After the last design mock-up is approved, the computer creates a bill of materials that goes to manufacturing to produce the order.

Output can be produced in a variety of ways. For a computer, printers and display screens are common output devices. Output can also be a manual process involving handwritten reports and documents.

Feedback

feedback
The output that is used to make changes to input or processing activities.

In information systems, **feedback** is output that is used to make changes to input or processing activities. For example, errors or problems might make it necessary to correct input data or change a process. Consider a payroll example. Perhaps the number of hours an employee worked was entered into a computer as 400 instead of 40 hours. Fortunately, most information systems check to ensure that data falls within certain ranges. For number of hours worked, the range might be from 0 to 100 hours because it is unlikely that an employee would work more than 100 hours for any given week. So, the information system would determine that 400 hours is out of range and provide feedback, such as an error report. The feedback is used to check and correct the input on the number of hours worked to 40. If undetected, this error would result in a very high net pay on the printed paycheck! Some blame the August 14, 2003 power blackout in the United States' Northeast on a faulty computer system that wasn't able to provide second-by-second feedback.[2]

Feedback is also important for managers and decision makers. For example, a bedding maker used a computerized feedback system to link its suppliers and plants. The output from an information system might indicate that inventory levels for a few items are getting low—a potential problem. A manager could use this feedback to decide to order more inventory from a supplier. The new inventory orders then become input to the system. In addition to this *reactive* approach, a computer system can also be *proactive*—predicting future events to avoid problems. This concept, often called **forecasting**, can be used to estimate future sales and order more inventory before a shortage occurs.

forecasting
The process of predicting future events to avoid problems.

Manual and Computerized Information Systems

As discussed earlier, an information system can be manual or computerized. For example, some investment analysts manually draw charts and trend lines to assist them in making investment decisions. Tracking data on stock prices (input) over the last few months or years, these analysts develop patterns on graph paper (processing) that help them determine what stock prices are likely to do in the next few days or weeks (output). Some investors have made millions of dollars using manual stock analysis information systems. Of course, today many excellent computerized information systems have been developed to follow stock indexes and markets and to suggest when large blocks of stocks should be purchased or sold (called *program trading*) to take advantage of market discrepancies. It is important to stress, however, that simply computerizing a manual information system does not guarantee improved system performance. If the underlying information system is flawed, the act of computerizing it might only magnify the impact of these flaws.

Program trading systems allow traders to keep up with swift changes in stock prices and make better decisions for their investors.

(Source: © Reuters NewMedia Inc./ CORBIS.)

Computer-Based Information Systems

A **computer-based information system** (**CBIS**) is a single set of hardware, software, databases, telecommunications, people, and procedures that are configured to collect, manipulate, store, and process data into information. For example, a company's payroll systems, order entry systems, or inventory control systems are examples of a CBIS. The components of a CBIS are illustrated in Figure 1.4. (*Information technology (IT)* is a related term. For our purposes, IT refers to the technology components of hardware, software, databases, and telecommunications.) A business's **technology infrastructure** includes all the hardware, software, databases, telecommunications, people, and procedures that are configured to collect, manipulate, store, and process data into information. The technology infrastructure is a set of shared IS resources that form the foundation of computer-based information systems.

computer-based information system (CBIS)
A single set of hardware, software, databases, telecommunications, people, and procedures that are configured to collect, manipulate, store, and process data into information.

technology infrastructure
All the hardware, software, databases, telecommunications, people, and procedures that are configured to collect, manipulate, store, and process data into information.

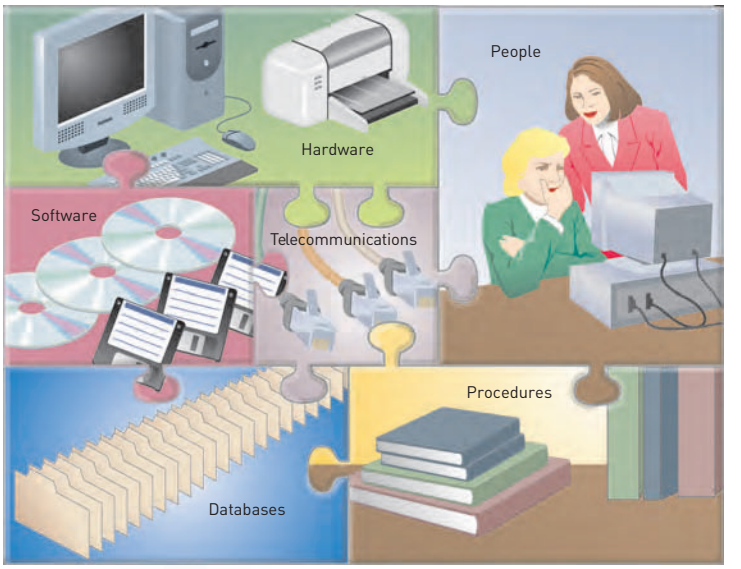
Hardware

Hardware consists of computer equipment used to perform input, processing, and output activities.[3] Input devices include keyboards, automatic scanning devices, equipment that can read magnetic ink characters, and many other devices. Investment firms often use voice response to allow customers to get their balances and other information using ordinary spoken sentences. The Scripps Institution of Oceanography developed a special underwater computer optical input device to allow a diver as deep as 100 feet to control an underwater camera, which was formerly controlled by a computer system and mouse on the surface.[4] Processing devices include the central processing unit and main memory.[5] Processor speed is important in creating video images.[6] Lifelike movie characters such as Gollum in the *Lord of the Rings* shows what is possible with today's fast processors. Mental Images of Germany and Pixar of the United States have used such award-winning image-rendering techniques. The technology is also used to help design cars, such as the sleek shapes of Mercedes-Benz vehicles. Specialized, inexpensive hardware has also been used in schools to help students learn a variety of subjects.[7] Michael Dell, founder of Dell Inc., believes that hardware will increasingly include very small devices that are connected to other hardware devices: "Nanotechnology

hardware
The computer equipment used to perform input, processing, and output activities.

Figure 1.4

The Components of a Computer-Based Information System



and communications will be in everything. All kinds of other devices will attach and link together, centered, I think, with the PC."[8] *Nanotechnology* can involve molecule-sized hardware devices.[9]

software
The computer programs that govern the operation of the computer.

Software

Software is the computer programs that govern the operation of the computer. These programs allow a computer to process payroll, send bills to customers, and provide managers with information to increase profits, reduce costs, and provide better customer service.[10] With software, people can work anytime at any place. On a trip back to the United States from Australia and New Zealand, Steve Ballmer, CEO of Microsoft commented, "I could carry my slides, I could carry my e-mail. I could carry anything I needed to read. I could carry my life with me. It was very powerful."[11] There are two basic types of software: system software, such as Windows XP, which controls basic computer operations such as start-up and printing, and applications software, such as Office 2003, which allows specific tasks to be accomplished, such as word processing or tabulating numbers.

database
An organized collection of facts and information.

Databases

A **database** is an organized collection of facts and information, typically consisting of two or more related data files. An organization's database can contain facts and information on customers, employees, inventory, competitors' sales information, online purchases, and much more. Most managers and executives believe a database is one of the most valuable and important parts of a computer-based information system. Increasingly, organizations are placing important databases on the Internet, discussed next.[12]

telecommunications
The electronic transmission of signals for communications; enables organizations to carry out their processes and tasks through effective computer networks.

networks
The connected computers and computer equipment in a building, around the country, or around the world to enable electronic communications.

Telecommunications, Networks, and the Internet

Telecommunications is the electronic transmission of signals for communications, which enables organizations to carry out their processes and tasks through effective computer networks.[13] Large restaurant chains, for example, can use telecommunications systems and satellites to link hundreds of restaurants to plants and corporate headquarters to speed credit card authorization and report sales and payroll data. **Networks** are used to connect computers and computer equipment in a building, around the country, or around the world to enable electronic communications. Investment firms can use wireless networks to connect thousands of people with their corporate offices. Hotel Commonwealth in Boston uses wireless telecommunications to allow guests to connect to the Internet, get voice messages, and perform other functions without plugging their computers or mobile devices into a wall outlet.[14] Wireless transmission is also allowing drones, like Boeing's Scan Eagle, to monitor power lines, buildings, and other commercial establishments.[15] One company uses a private network to connect offices in the United States, Germany, China, Korea, and

other companies. It doesn't use a public network available to everyone, such as the Internet, discussed next.

The **Internet** is the world's largest computer network, actually consisting of thousands of interconnected networks, all freely exchanging information. Research firms, colleges, universities, high schools, and businesses are just a few examples of organizations using the Internet. Table 1.3 lists companies that have used the Internet to their advantage.

Internet
The world's largest computer network, actually consisting of thousands of interconnected networks, all freely exchanging information.

Organization	Objective	Description of Internet Usage
Godiva Chocolatier	Increase sales and profits	The company developed a very profitable Internet site that allows customers to buy and ship chocolates. According to Kim Land, director of Godiva Direct, "This was set up from the beginning to make money." In two years, online sales have soared by more than 70% each year.
Environmental Defense	Alert the public to environmental concerns	The organization, formerly the Environmental Defense Fund, successfully used the Internet to alert people to the practice of catching sharks, removing their fins for soup, and returning them to the ocean to die. The Internet site also helped people fax almost 10,000 letters to members of Congress about the practice. According to Fred Krupp, the executive director of the Environmental Fund, "The Internet is the ultimate expression of 'think global, act local.'"
Buckman Laboratories	Better employee training	The company used the Internet to train employees to sell specialty chemicals to paper companies, instead of bringing them to Memphis for training. According to one executive, "Our retention rate is much higher, and we removed a week [of training] in Memphis, which meant big savings." Using the Internet lowered the hourly cost of training an employee from $1,000 to only $40.
Siemens	Reduce costs	Using the Internet, the company, which builds and services power plants, was able to reduce the cost of entering orders and serving customers. The Internet solution cost about $60,000 compared with a traditional solution that would have cost of $600,000.
Goldman Industrial Group	Save time	The company makes machine tools and was able to slash the time it takes to fill an order from three or four months to about a week using the Internet to help coordinate parts and manufacturing with its suppliers and at its plants.
Partnership America	Make better decisions	The company developed an Internet site for wholesalers of computer equipment and supplies. The wholesalers use the site to make better decisions about the features and prices of various pieces of computer equipment. The system allows wholesalers to connect to Partnership America's site using cell phones. "When many of our customers need information, they're not at their desks," says one company representative.
Altra Energy Technologies	Get energy to companies that need it	The company developed an Internet site to help companies buy oil, gas, and wholesale power over the Internet.

Table 1.3
Uses of the Internet

The *World Wide Web (WWW)* or the *Web* is a network of links on the Internet to documents containing text, graphics, video, and sound. Information about the documents and access to them are controlled and provided by tens of thousands of special computers called *Web servers*. The Web is one of many services available over the Internet and provides access to literally millions of documents.

The technology used to create the Internet is now also being applied within companies and organizations to create an **intranet**, which allows people within an organization to exchange information and work on projects. The Virgin Group, for example, uses an intranet to connect its 200 global operating companies and 20,000 employees.[16] According to Ashley Stockwell of the Virgin Group, "One of our key challenges at Virgin is to provide high-quality service to our family of companies. One key tool to help us provide this was the development of an intranet and extranet." An **extranet** is a network based on Web technologies that allows selected outsiders, such as business partners and customers, to access authorized resources on a company's intranet. Companies can move all or most of their business activities to an extranet site for corporate customers. Many people use extranets every day without realizing it—to track shipped goods, order products from their suppliers, or

intranet
An internal network based on Web technologies that allows people within an organization to exchange information and work on projects.

extranet
A network based on Web technologies that allows selected outsiders, such as business partners and customers, to access authorized resources of the intranet of a company.

access customer assistance from other companies. Log on to the FedEx site to check the status of a package, for example, and you are using an extranet.

People

People are the most important element in most computer-based information systems. Information systems personnel include all the people who manage, run, program, and maintain the system. Large banks can hire hundreds of IS personnel to speed up the development of computer-related projects. Users are any people who use information systems to get results. Users include financial executives, marketing representatives, manufacturing operators, and many others. Certain computer users are also IS personnel.

Procedures

procedures
The strategies, policies, methods, and rules for using a CBIS.

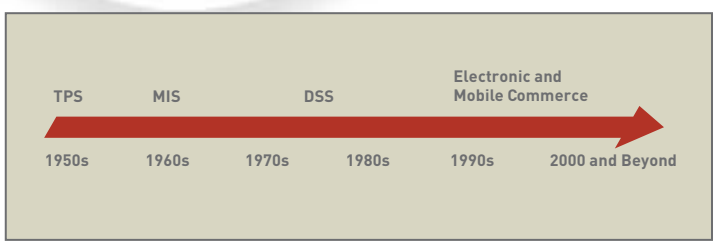
Procedures include the strategies, policies, methods, and rules for using the CBIS. For example, some procedures describe when each program is to be run or executed. Others describe who can have access to facts in the database. Still other procedures describe what is to be done in case a disaster, such as a fire, an earthquake, or a hurricane that renders the CBIS unusable.

Now that we have looked at computer-based information systems in general, we briefly examine the most common types used in business today. These IS types are covered in more detail in Part 3.

BUSINESS INFORMATION SYSTEMS

The most common types of information systems used in business organizations are electronic and mobile commerce systems, transaction processing systems, management information systems, and decision support systems. In addition, some organizations employ special-use systems, such as artificial intelligence systems, expert systems, and virtual reality systems. Together, these systems help employees in organizations accomplish both routine and special tasks—from recording sales, to processing payrolls, to supporting decisions in various departments, to providing alternatives for large-scale projects and opportunities. Figure 1.5 gives a simple overview of the development of important business information systems discussed in this section.

Figure 1.5
The Development of Important Business Information Systems



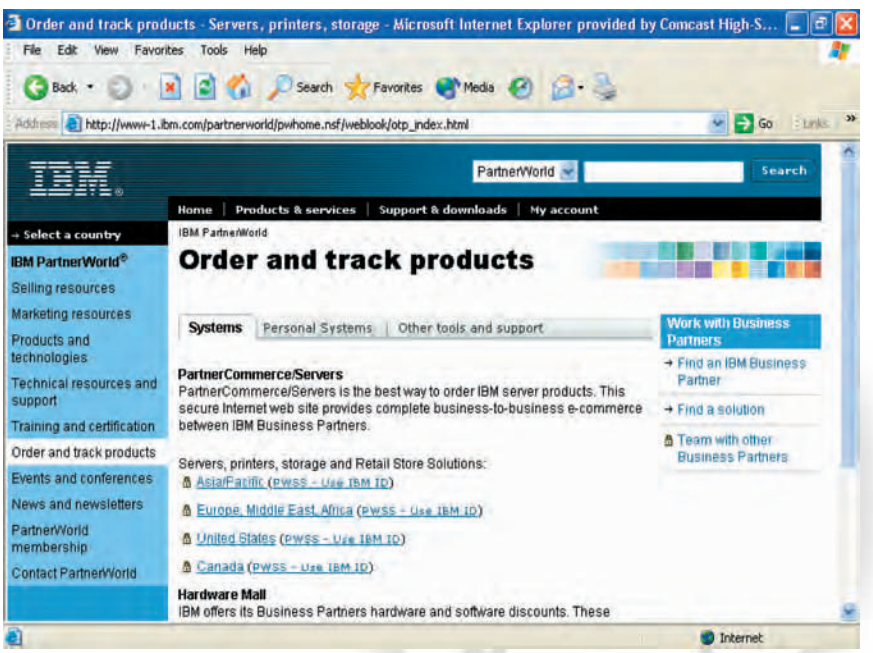
Electronic and Mobile Commerce

e-commerce
Any business transaction executed electronically between parties such as companies (business-to-business, B2B), companies and consumers (business-to-consumer, B2C), consumers and other consumers (consumer-to-consumer, C2C), businesses and the public sector, and consumers and the public sector.

E-commerce involves any business transaction executed electronically between parties such as companies (business-to-business, B2B), companies and consumers (business-to-consumer, B2C), consumers and other consumers (consumer-to-consumer, C2C), businesses and the public sector, and consumers and the public sector. People might assume that e-commerce is reserved mainly for consumers visiting Web sites for online shopping. But Web shopping is only a small part of the e-commerce picture; the major volume of e-commerce—and its fastest-growing segment—is business-to-business (B2B) transactions that make purchasing easier for corporations. This growth is being stimulated by increased Internet access, growing user confidence, better payment systems, and rapidly improving Internet and Web security.

Corporate Express, an office-supply company located in Broomfield, Colorado, uses a sophisticated B2B system to coordinate billions of dollars of office supplies that flow from its suppliers, through its offices, to its customers.[17] Today, more than half of its 75,000 daily orders arrive electronically through B2B on the Internet. E-commerce offers opportunities for small businesses, too, by enabling them to market and sell at a low cost worldwide, thus allowing them to enter the global market right from start-up. **Mobile commerce (m-commerce)** is transactions conducted anywhere, anytime. M-commerce relies on the use of wireless communications to allow managers and corporations to place orders and conduct business using handheld computers, portable phones, laptop computers connected to a network, and other mobile devices.

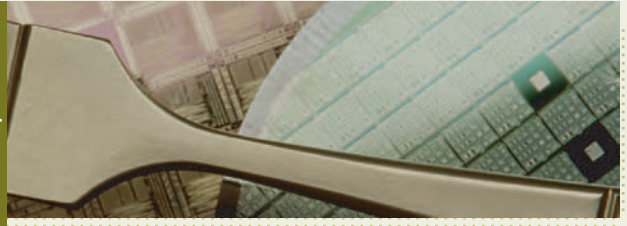
mobile commerce (m-commerce)
Transactions conducted anywhere, anytime.



IBM PartnerWorld® is an example of B2B (business-to-business) e-commerce that provides member companies with resources for product marketing, technical support, and training.

Consumers who have tried online shopping appreciate the ease of e-commerce. They can avoid fighting crowds in the malls, shop online at any time from the comfort of their home, and have goods delivered to them directly. As a result, advertisers plan to increase spending by 6.3 percent online versus 4.7 percent in conventional media.[18] In addition, current laws governing online purchases exempt purchasers from paying state sales taxes. However, e-commerce is not without its downside. Consumers continue to have concerns about sending credit card information over the Internet to sites with varying security measures, where high-tech criminals could obtain it. See the "Ethical and Societal Issues" feature, which discusses other potential problems of e-commerce.

Figure 1.6 provides a brief example of how e-commerce can simplify the process for purchasing new office furniture from an office-supply company. Business-to-business e-commerce automates the entire process. Employees go directly to the supplier's Web site, find the item in its catalog, and order what they need at a price set by the employee's company. If approval is required, the approver is notified automatically. As the use of e-commerce systems grows, companies are phasing out their traditional systems. The resulting growth of e-commerce is creating many new business opportunities.



Phishing for Visa Card Customers

A new type of Internet fraud is becoming increasingly prevalent—and costing consumers their money and identity. This latest scam is called *phishing* because it uses e-mail and Web sites as bait to lure consumers into revealing private information.

E-commerce systems rely on the trust of the participants. If they do not trust the technology to provide safe and secure transactions, e-commerce would have no future. Although network research has produced more secure connections between two parties over the Internet, no foolproof systems exist to guarantee that the participants are who they claim to be. Phishing scams exploit this system vulnerability.

A phishing scam was recently launched against Visa card customers and serves as a textbook example of the technique. A mass e-mail was sent to Internet users with an official-looking Visa return address, claiming to have come from Visa International Services. Sending e-mail with a forged return address is a common practice in Internet fraud and is formally referred to as *spoofing*. The e-mail stated that Visa had implemented a new "security system to help you to avoid possible fraud actions" and asked users to click a link to "reactivate your account." The link was printed as *www.visa.com*, but when users clicked the link, it took them to a Web site that resembled the Visa Web site—with an official Visa logo, artwork, and design—but was not owned by Visa. The site asked customers to enter personal information, including their Visa credit card number. The scam artists then had both a customer's account number and name.

The 2003 holiday season saw a 400 percent increase in phishing scams, with 60 unique attacks launched and more than 60 million fraudulent e-mails sent out. It is estimated that 5 to 20 percent of recipients respond to phishing scams. In the Visa scam, the owners of the fraudulent site shut down and disappeared prior to discovery, taking with them an unknown quantity of customer records. The information they stole could be sold in the underground credit card market and used by crooks and thieves to assume the identity of the victims and make illegal purchases.

Phishing scams are increasingly difficult to detect. The fraudulent e-mails and Web sites look identical to original corporate correspondence and Web sites. Web addresses appear legitimate and might even employ secure connections (identified by the closed-lock icon at the bottom of the browser window). Such scams make it difficult for legitimate businesses to communicate electronically with their customers and to conduct business online. "At stake is our very trust that the Internet can be relied upon for safe and secure commerce and communications," says Dave Jevans, chairman of the Anti-Phishing Working Group (*www.antiphishing.org*).

Software tools designed to detect phishing scams typically identify only 50 to 70 percent of all phony systems. The only defense consumers have against such scams is education—and caution. Be leery of any e-mail from a company that asks you to visit a Web page to provide private information. Check with the company at its official Web site to confirm that such requests are legitimate before complying.

Critical Thinking Questions

1. How can people protect themselves from becoming a victim of a phishing scam?
2. What action can people take if they discover that their private information has been stolen?

What Would You Do?

You've received an e-mail from your college's financial aid department that congratulates you on being the recipient of funds from a newly launched grant program. To receive your $2,000 for this semester, you are required to visit the financial aid Web site (*www.financial-aid.yourschool.com*) and submit a brief online application form. After filling out the form, which collects information such as your name, address, phone, date of birth, school ID number, Social Security number, and bank-account number (for automatic deposit), you click the *Submit* button and head out to celebrate your good fortune. After a week, the money has yet to be deposited, and you are getting concerned.

3. What in this scenario suggests that this might be a phishing scam?
4. If you were responsible for information security at your school, what system might you design to assure students that official school correspondence really comes from the school and not from an imposter?

SOURCES: Paul Roberts, "Latest 'Phishing' Scam Targets Visa Customers," *Computerworld*, December 26, 2003, *www.computerworld.com*; "Growth in Internet Fraud to Be Key Concern in 2004," *Electronic Commerce News*, January 5, 2004; the Anti-Phishing group Web site, *www.anti-phishing.org*, accessed January 17, 2004.

Figure 1.6
E-Commerce Greatly Simplifies Purchasing

In addition to e-commerce, business information systems include the use of telecommunications and the Internet to perform many related tasks. *Electronic procurement (e-procurement)*, for example, involves using information systems and the Internet to acquire parts and supplies using information systems and the Internet. *Electronic business (e-business)* goes beyond e-commerce to include the use of information systems and the Internet to perform all business-related tasks and functions, such as accounting, finance, marketing, manufacturing, and human resource activities. *Electronic management (e-management)* involves the use of information systems and the Internet to manage profit and nonprofit organizations, including governmental agencies, military, religious, and charitable organizations. E-management includes all aspects of staffing and hiring, directing, controlling, and other management tasks.

Transaction Processing Systems and Enterprise Resource Planning

Since the 1950s, computers have been used to perform common business applications. The objective of many of these early systems was to reduce costs by automating many routine, labor-intensive business systems. Today, transaction processing systems and enterprise resource planning are often used to perform common business applications.

Transaction Processing Systems

A **transaction** is any business-related exchange, such as payments to employees, sales to customers, or payments to suppliers. Thus, processing business transactions was the first application of computers for most organizations. A **transaction processing system** (TPS) is an organized collection of people, procedures, software, databases, and devices used to record

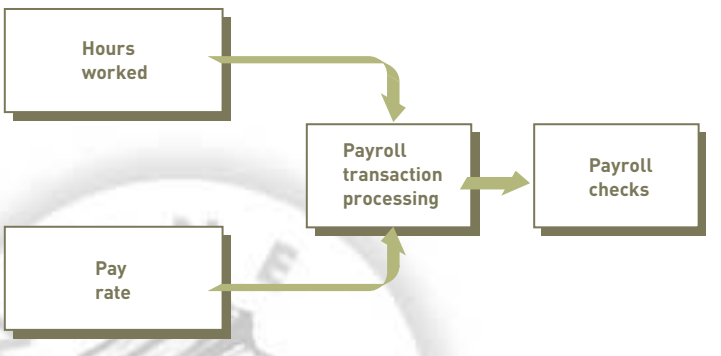
transaction
Any business-related exchange such as payments to employees, sales to customers, and payments to suppliers.

transaction processing system (TPS)
An organized collection of people, procedures, software, databases, and devices used to record completed business transactions.

completed business transactions. To understand a transaction processing system is to understand basic business operations and functions.

One of the first business systems to be computerized was the payroll system (see Figure 1.7). The primary inputs for a payroll TPS are the numbers of employee hours worked during the week and pay rate. The primary output consists of paychecks. Early payroll systems were able to produce employee paychecks, along with important employee-related reports required by state and federal agencies, such as the Internal Revenue Service. Other routine applications include sales ordering, customer billing and customer relationship management, inventory control, and many other applications. Some automobile companies, for example, use their TPS to buy billions of dollars of needed parts each year through Internet sites. Because these systems handle and process daily business exchanges, or transactions, they are all classified as TPSs.

Figure 1.7
A Payroll Transaction Processing System
The inputs (numbers of employee hours worked and pay rates) go through a transformation process to produce outputs (paychecks).



Enterprise Resource Planning

enterprise resource planning (ERP) system
A set of integrated programs capable of managing a company's vital business operations for an entire multisite, global organization.

An **enterprise resource planning (ERP) system** is a set of integrated programs that is capable of managing a company's vital business operations for an entire multisite, global organization. ERP systems can replace many applications with one unified set of programs. Sutter Health, a large network of 33 hospitals with more than 4 million patients in northern California, uses an ERP system to process medical transactions and to exchange information between hospitals, physicians, and employees.[19] Although the scope of an ERP system can vary from company to company, most ERP systems provide integrated software to support the manufacturing and finance business functions of an organization. In such an environment, a forecast is prepared that estimates customer demand for several weeks. The ERP system checks what is already available in finished product inventory to meet the projected demand. Manufacturing must then produce inventory to eliminate any shortcomings. In developing the production schedule, the ERP system checks inventory levels and determines what needs to be ordered to meet the schedule. Most ERP systems also have a purchasing subsystem that orders the needed items. In addition to these core business processes, some ERP systems can support additional business functions, such as human resources, sales, and distribution. Customer relationship management (CRM) features, for example, help organizations manage all aspects of customer interactions, including inquiries, sales, delivery of products and services, and support after the sale.

Information and Decision Support Systems

Although early accounting and financial TPSs were already valuable, companies soon realized that the data stored in these systems could be used to help managers make better decisions in their respective business areas, whether human resource management, marketing, or administration. Satisfying the needs of managers and decision makers continues to be a major factor in developing information systems, discussed later.

Management Information Systems

A **management information system** (MIS) is an organized collection of people, procedures, software, databases, and devices used to provide routine information to managers and decision makers. The focus of an MIS is primarily on operational efficiency. Marketing, production, finance, and other functional areas are supported by MISs and linked through a common database. Management information systems typically provide standard reports generated with data and information from the TPS (see Figure 1.8).

management information system (MIS)
An organized collection of people, procedures, software, databases, and devices used to provide routine information to managers and decision makers.

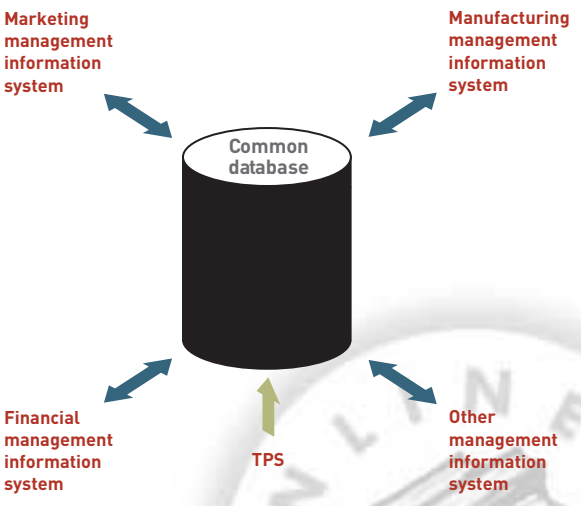


Figure 1.8
Functional management information systems draw data from the organization's transaction processing system.

Decision Support Systems

By the 1980s, dramatic improvements in technology resulted in information systems that were less expensive but more powerful than earlier systems. People at all levels of organizations began using personal computers to do a variety of tasks; they were no longer solely dependent on the IS department for all their information needs. So, people quickly recognized that computer systems could support additional decision-making activities. A **decision support system** (**DSS**) is an organized collection of people, procedures, software, databases, and devices used to support problem-specific decision making. The focus of a DSS is on decision-making effectiveness. Whereas an MIS helps an organization "do things right," a DSS helps a manager "do the right thing." Oxford Bookstore, located in Calcutta, uses a DSS and the Internet to allow book lovers in India to purchase their favorite books at Oxford's traditional retail stores or through its Internet site. The Internet site provides a wealth of information to help people make better book-purchasing decisions.[20] Blue Cross of Pennsylvania uses a DSS from InterQual to help it support level-of-care decisions.[21]

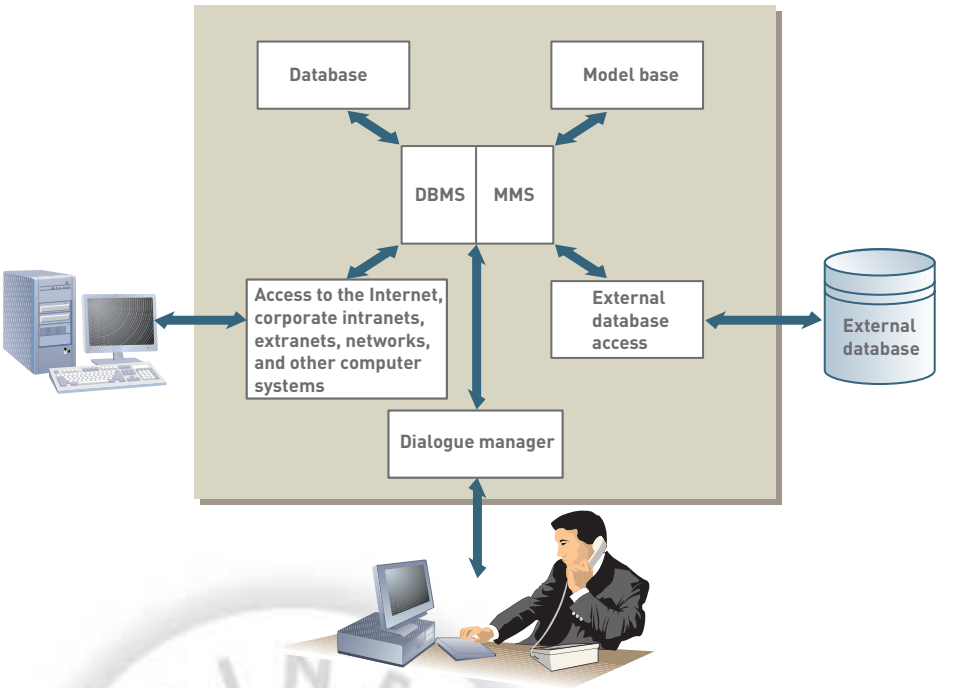
decision support system (DSS)
An organized collection of people, procedures, software, databases, and devices used to support problem-specific decision making.

The essential elements of a DSS include a collection of models used to support a decision maker or user (model base), a collection of facts and information to assist in decision making (database), and systems and procedures (dialogue manager) that help decision makers and other users interact with the DSS (see Figure 1.9). Software is often used to manage the database (the database management system, DBMS) and the model base (the model management system, MMS).

In addition to DSSs that support individual decision making, group decision support systems and executive support systems use the same overall approach of a DSS. A group support system, also called a *group decision support system*, includes the DSS elements just described and software, called *groupware*, to help groups make effective decisions. An executive support system, also called an *executive information system*, helps top-level managers, including a firm's president, vice presidents, and members of the board of directors, make better decisions. An executive support system can be used to assist with strategic planning, top-level organizing and staffing, strategic control, and crisis management.

Figure 1.9

Essential DSS Elements



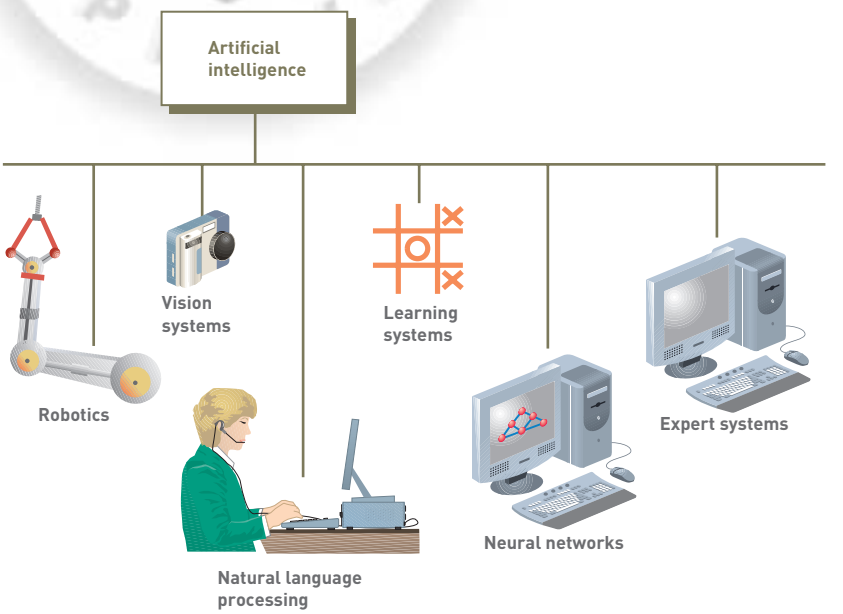
Specialized Business Information Systems: Artificial Intelligence, Expert Systems, and Virtual Reality

artificial intelligence (AI)
A field in which the computer system takes on the characteristics of human intelligence.

In addition to TPSs, MISs, and DSSs, organizations often use specialized systems. One of these systems is based on the notion of **artificial intelligence** (**AI**), in which the computer system takes on the characteristics of human intelligence. The field of artificial intelligence includes several subfields (see Figure 1.10).

Figure 1.10

The Major Elements of Artificial Intelligence



Artificial Intelligence

Robotics is an area of artificial intelligence in which machines take over complex, dangerous, routine, or boring tasks, such as welding car frames or assembling computer systems and components. Vision systems allow robots and other devices to have "sight" and to store and

process visual images. Natural language processing involves the ability of computers to understand and act on verbal or written commands in English, Spanish, or other human languages. Learning systems give computers the ability to learn from past mistakes or experiences, such as playing games or making business decisions, and neural networks is a branch of artificial intelligence that allows computers to recognize and act on patterns or trends. Some successful stock, options, and futures traders use neural networks to spot trends and make them more profitable with their investments.

Expert Systems

Expert systems give the computer the ability to make suggestions and act like an expert in a particular field. The unique value of expert systems is that they allow organizations to capture and use the wisdom of experts and specialists. Therefore, years of experience and specific skills are not completely lost when a human expert dies, retires, or leaves for another job. Expert systems can be applied to almost any field or discipline. Expert systems have been used to monitor complex systems such as nuclear reactors, perform medical diagnoses, locate possible repair problems, design and configure IS components, perform credit evaluations, and develop marketing plans for a new product or new investment strategies. The collection of data, rules, procedures, and relationships that must be followed to achieve value or the proper outcome is contained in the expert system's **knowledge base**.

expert system
A system that gives a computer the ability to make suggestions and act like an expert in a particular field.

knowledge base
The collection of data, rules, procedures, and relationships that must be followed to achieve value or the proper outcome.

Virtual Reality

Virtual reality is the simulation of a real or imagined environment that can be experienced visually in three dimensions. Virtual worlds can be animated, interactive, and shared.

A variety of input devices such as head-mounted displays (see Figure 1.11), data gloves (see Figure 1.12), joysticks, and handheld wands allow the user to navigate through a virtual environment and to interact with virtual objects. Directional sound, tactile and force feedback devices, voice recognition, and other technologies are used to enrich the immersive experience. Several people can share and interact in the same environment. Because of this ability, virtual reality can be a powerful medium for communication, entertainment, and learning.

virtual reality
The simulation of a real or imagined environment that can be experienced visually in three dimensions.

Figure 1.11

A Head-Mounted Display

The head-mounted display (HMD) was the first device of its kind providing the wearer with an immersive experience. A typical HMD houses two miniature display screens and an optical system that channels the images from the screens to the eyes, thereby presenting a stereo view of a virtual world. A motion tracker continuously measures the position and orientation of the user's head and allows the image-generating computer to adjust the scene representation to the current view. As a result, the viewer can look around and walk through the surrounding virtual environment.

(Source: Image courtesy of 5DT, Inc., *www.5DT.com*.)

It is difficult to predict where information systems and technology will be in 10 to 20 years. It seems, however, that we are just beginning to discover the full range of their usefulness. Technology has been improving and expanding at an increasing rate; dramatic growth and change are expected for years to come. Without question, a knowledge of the effective use of information systems will be critical for managers both now and in the long term. But how are these information systems created?

Figure 1.12

A Data Glove

Realistic interactions with virtual objects via such devices as a data glove that senses hand position allow for manipulation, operation, and control of virtual worlds. (Source: Image courtesy of 5DT, Inc., *www.5DT.com*.)

SYSTEMS DEVELOPMENT

systems development
The activity of creating or modifying existing business systems.

Systems development is the activity of creating or modifying existing business systems. People inside a company can develop systems, or companies can use *outsourcing*, hiring an outside company to perform some or all of a systems development project. Outsourcing allows a company to focus on what it does best and delegate other functions to companies with expertise in systems development. Cox Insurance Holdings, for example, outsourced its commercial underwriting operations to another company.[22] Outsourcing enabled Cox Insurance to streamline its operations and reduce costs. Outsourcing, however, is not the best alternative for all companies. Toyota recently stopped outsourcing its financial services and started to perform the financial services function internally.[23] According to the director of Toyota Financial Services, "You depend on that service provider. You worry about whether or not it will be in business next year, and whether or not it will be able to service you consistently throughout the terms of the agreement and beyond." Other companies have used outsourcing for software development, database development, and other aspects of systems development.

The first two steps of systems development are systems investigation and analysis. The goal of the *systems investigation* is to gain a clear understanding of the problem to be solved or opportunity to be addressed. A cruise line company, for example, might launch a systems investigation to determine whether a development project is feasible to automate purchasing at ports around the world. After an organization understands the problem, the next question to be answered is "Is the problem worth solving?" Given that organizations have limited resources—people and money—this question deserves careful consideration. If the decision is to continue with the solution, the next step, *systems analysis*, defines the problems and opportunities of the existing system.

Systems design determines how the new system will work to meet the business needs defined during systems analysis. *Systems implementation* involves creating or acquiring the various system components (hardware, software, databases, etc.) defined in the design step, assembling them, and putting the new system into operation. The purpose of *systems maintenance and review* is to check and modify the system so that it continues to meet changing needs of today's organizations.

ORGANIZATIONS AND INFORMATION SYSTEMS

An **organization** is a formal collection of people and other resources established to accomplish a set of goals. The primary goal of a for-profit organization is to maximize shareholder value, often measured by the price of the company stock. Nonprofit organizations include social groups, religious groups, universities, and other organizations that do not have profit as the primary goal.

organization
A formal collection of people and other resources established to accomplish a set of goals.

An organization is a system. Money, people, materials, machines and equipment, data, information, and decisions are constantly in use in any organization. As shown in Figure 1.13, resources such as materials, people, and money are input to the organizational system from the environment, go through a transformation mechanism, and are output to the environment. The outputs from the transformation mechanism are usually goods or services. The goods or services produced by the organization are of higher relative value than the inputs alone. Through adding value or worth, organizations attempt to achieve their goals.

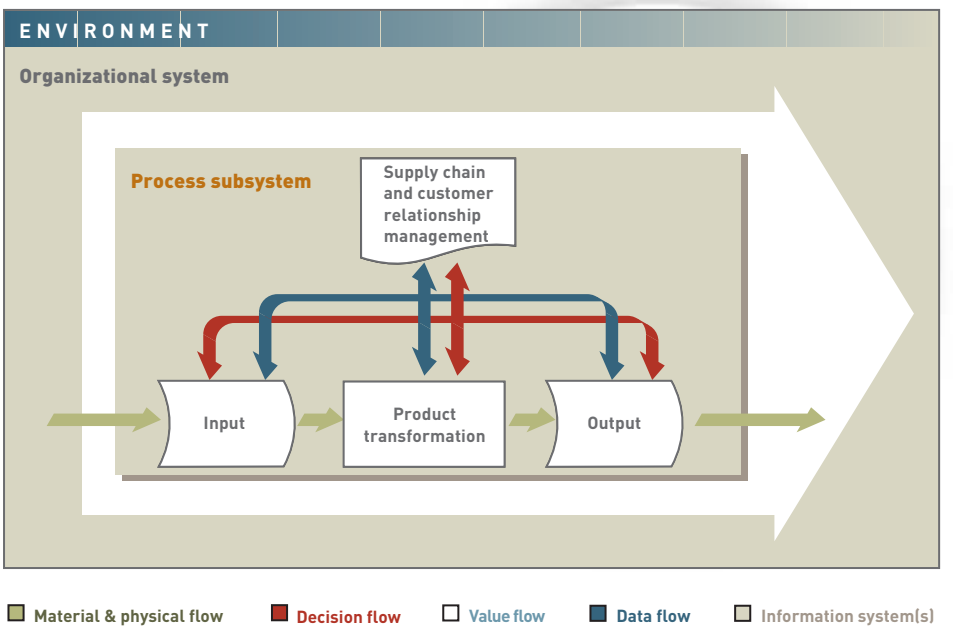


Figure 1.13

A General Model of an Organization

Information systems support and work within all parts of an organizational process. Although not shown in this simple model, input to the process subsystem can come from internal and external sources. Just prior to entering the subsystem, data is external. After it enters the subsystem, it becomes internal. Likewise, goods and services can be output to either internal or external systems.

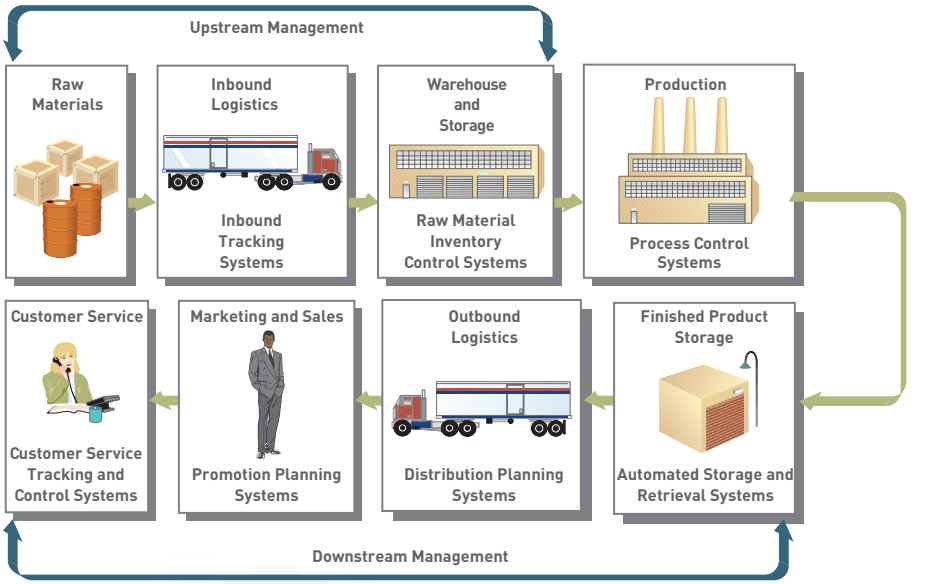
All business organizations contain a number of processes. Providing value to a stakeholder—customer, supplier, manager, or employee—is the primary goal of any organization. The value chain, first described by Michael Porter, a prominent management theorist, in a 1985 *Harvard Business Review* article, is a concept that reveals how organizations can add value to their products and services. The **value chain** is a series (chain) of activities that includes inbound logistics, warehouse and storage, production, finished product storage, outbound logistics, marketing and sales, and customer service (see Figure 1.14). Each of these activities is investigated to determine what can be done to increase the value perceived by a customer. Depending on the customer, value might mean lower price, better service, higher quality, or uniqueness of product. The value comes from the skill, knowledge, time, and energy invested by the company. By adding a significant amount of value to their products and services, companies will ensure further organizational success. Cessna Aircraft, for example, has used supply chain management to improve the quality of supplies by about 86 percent and increase material availability by 28 percent.[24]

value chain
A series (chain) of activities that includes inbound logistics, warehouse and storage, production, finished product storage, outbound logistics, marketing and sales, and customer service.

Figure 1.14

The Value Chain of a Manufacturing Company

The management of raw materials, inbound logistics, and warehouse and storage facilities is called *upstream management*, and the management of finished product storage, outbound logistics, marketing and sales, and customer service is called *downstream management*.



Supply chain and customer relationship management are two key aspects of managing the value chain. *Supply chain management (SCM)* helps determine what supplies are required, what quantities are needed to meet customer demand, how the supplies are to be processed (manufactured) into finished goods and services, and how the shipment of supplies and products to customers is to be scheduled, monitored, and controlled. For an automotive company, for example, SCM is responsible for identifying key supplies and parts, negotiating with supply and parts companies for the best prices and support, ensuring all supplies and parts are available when they are needed to manufacture cars and trucks, and sending finished products to dealerships around the country when and where they are needed.

Customer relationship management (CRM) programs help a company manage all aspects of customer encounters, including marketing and advertising, sales, customer service after the sale, and programs to help keep and retain loyal customers.[25] CRM can help a company collect customer data, contact customers, educate customers on new products, and actively sell products to existing and new customers. Often, CRM software uses a variety of information sources, including sales from different retail stores, surveys, e-mails, and Internet browsing habits, to compile comprehensive customer profiles. CRM can also be used to get customer feedback to help design new products and services.

Organizational Culture and Change

culture
A set of major understandings and assumptions shared by a group.

organizational culture
The major understandings and assumptions for a business, a corporation, or an ogranization.

organizational change
The responses that are necessary for for-profit and nonprofit organizations to plan for, implement, and handle change.

The internal collective beliefs of and degree of change within organizations greatly affect their employees, processes, and overall effectiveness. **Culture** is a set of major understandings and assumptions shared by a group, for example, within an ethnic group or a country. **Organizational culture** consists of the major understandings and assumptions for a business, a corporation, or an organization. The understandings, which can include common beliefs, values, and approaches to decision making, are often not stated or documented as goals or formal policies. Employees, for example, might be expected to be clean-cut, wear conservative outfits, and be courteous in dealing with all customers. Sometimes, organizational culture is formed over years. In other cases, it can be formed rapidly by top-level managers—for example, implementation of a "casual Friday" dress policy. **Organizational change** deals with how for-profit and nonprofit organizations plan for, implement, and handle change. Change can be caused by internal or external factors. Internal factors include activities initiated by employees at all levels. External factors include activities wrought by competitors, stockholders, federal and state laws, community regulations, natural occurrences (such as hurricanes), and general economic conditions. Many European countries, for example, adopted the euro, a single European currency, which changed how financial companies do business and how they use their information systems.

Change can be sustaining or disruptive.[26] *Sustaining change* can help an organization improve the raw materials supply, the production process, and the products and services offered by the organization. New manufacturing equipment to make disk drives is an example of a sustaining change. The new equipment might reduce the costs of producing the disk drives and improve overall performance. *Disruptive change*, on the other hand, often harms an organization's performance or even puts it out of business. The 3.5-inch hard disk drive was a disruptive technology for companies that produced the 5.25-inch hard disk drive. When it was first introduced, the 3.5-inch drive was slower, had lower capacity, and lower demand than the existing 5.25-inch disk drives. Over time, however, the 3.5-inch drive improved and replaced the 5.25-inch drive in performance and demand. Some companies that produced the 5.25-inch drives that didn't change didn't survive. Today, many of the 5.25-inch drive companies are out of business. In general, disruptive technologies might not originally have good performance, low cost, or even strong demand. Over time, however, they often replace existing technologies. They can cause good, stable companies to fail when they don't change or adopt the new technology.

Cingular's planned acquisition of AT&T Wireless will combine the strengths of the two companies and is expected to create customer benefits and growth prospects neither company could have achieved on its own. Together, the companies can provide better coverage, improve reliability, enhance call quality, and offer a wide array of new and innovative services for consumers.

(Source: AP/Wide World Photos.)

Technology Diffusion, Infusion, and Acceptance

The use of technology also affects organizational processes. Even if a company buys or develops new computerized systems, managers and employees might never use them. Or, new systems might not be used to their potential. Millions of dollars can be wasted as a result. The extent to which new computerized systems are used throughout an organization can be measured by the amount of technology diffusion, infusion, and acceptance. **Technology diffusion** is a measure of how widely technology is spread throughout an organization. An organization in which computers and information systems are located in most departments and areas has a high level of technology diffusion.[27] Some online merchants, such as Amazon.com, have a high level of diffusion and use computer systems to perform most of their business functions, including marketing, purchasing, and billing. **Technology infusion**, on the other hand, is the extent to which technology permeates an area or department. In other words, it is a measure of how deeply embedded technology is in an area of the organization. Some architectural firms, for example, use computers in all aspects of designing a building or structure. This design area, thus, has a high level of infusion. Of course, it is possible for a firm to have a high level of infusion in one aspect of its operations and a low level of diffusion overall. The architectural firm might use computers in all aspects of design (high infusion in the design area) but might not use computers to perform other business functions, including billing, purchasing, and marketing (low diffusion).

technology diffusion
A measure of how widely technology is spread throughout the organization.

technology infusion
The extent to which technology is deeply integrated into an area or department.

Although an organization might have a high level of diffusion and infusion, with computers throughout the organization, it does not necessarily mean that information systems are being used to their full potential. In fact, the assimilation and use of expensive computer technology throughout organizations varies greatly.[28] One reason is a low degree of acceptance and use of the technology among some managers and employees. Research has attempted to explain the important factors that enhance or hinder the acceptance and use of information systems.[29] A number of possible explanations of technology acceptance and usage have been studied. The **technology acceptance model** (**TAM**) specifies the factors that can lead to higher acceptance and usage of technology in an organization, including the perceived usefulness of the technology, the ease of its use, the quality of the information system, and the degree to which the organization supports the use of the information system.[30] Companies hope that a high level of diffusion, infusion, and acceptance will lead to greater performance and profitability.[31]

technology acceptance model (TAM)
A model that describes the factors that can lead to higher acceptance and usage of technology.

Organizations in a Global Society

Organizations do not operate in a vacuum. The society or societies in which they operate contribute to or detract from their operations and overall success. Increasingly, organizations operate in a global society. An American company, for example, can get inputs for products and services from Europe, assemble them in Asia, and ship them to customers in

Australia and New Zealand. After-the-sale support can be given by a call center in India. The Internet and telecommunications make this trend possible.

There are, however, many challenges to operating in a global society. Some countries have seen high-paying jobs transferred to other countries, where labor and production costs are lower. In addition, every country has a set of customs, cultures, standards, politics, and laws that can make it difficult for businesses operating around the world. Language can also be a potential problem. Some companies that outsourced their call centers to foreign countries are now moving them back because of customer complaints. It can also be more difficult to manage and control operations in different countries. Many of today's organizations operate globally to give them a competitive advantage, discussed next.

COMPETITIVE ADVANTAGE

competitive advantage
A significant and (ideally) long-term benefit to a company over its competition.

A **competitive advantage** is a significant and (ideally) long-term benefit to a company over its competition. Establishing and maintaining a competitive advantage is complex, but a company's survival and prosperity depend on its success in doing so. In his book *Good To Great*, Jim Collins outlined how technology can be used to accelerate companies from good to great.[32] Table 1.4 shows how a few companies accomplished this move. Ultimately, it is not how much a company spends on information systems but how investments in technology are made and managed. Companies can spend less and get more value.

Table 1.4

How Some Companies Used Technology to Move from Good to Great

(Source: Data from Jim Collins, *Good to Great*, Harper Collins Books, 2001, p. 300.)

Company	Business	Competitive Use of Information Systems
Circuit City	Consumer electronics	Developed sophisticated sales and inventory-control systems to deliver a consistent experience to customers
Gillette	Shaving products	Developed advanced computerized manufacturing systems to produce high-quality products at low cost
Walgreens	Drug and convenience stores	Developed satellite communications systems to link local stores to centralized computer systems
Wells Fargo	Financial services	Developed 24-hour banking, ATMs, investments, and increased customer service using information systems

Factors That Lead Firms to Seek Competitive Advantage

five-forces model
A widely accepted model that identifies five key factors that can lead to attainment of competitive advantage, including (1) the rivalry among existing competitors, (2) the threat of new entrants, (3) the threat of substitute products and services, (4) the bargaining power of buyers, and (5) the bargaining power of suppliers.

A number of factors can lead to the attainment of competitive advantage. Michael Porter, in his research on competitive forces, suggested a now widely accepted model, sometimes called the **five-forces model**. The five forces include (1) the rivalry among existing competitors, (2) the threat of new entrants, (3) the threat of substitute products and services, (4) the bargaining power of buyers, and (5) the bargaining power of suppliers. The more these forces combine in any instance, the more likely firms will seek competitive advantage and the more dramatic the results of such an advantage will be.

Rivalry Among Existing Competitors

The rivalry among existing competitors is an important factor leading firms to seek competitive advantage. Typically, highly competitive industries are characterized by high fixed costs of entering or leaving the industry, low degrees of product differentiation, and many competitors. Although all firms are rivals with their competitors, industries with stronger rivalries tend to have more firms seeking competitive advantage. To compete with existing competitors, companies are constantly analyzing how their resources and assets are used. The *resource-based view* is an approach to acquiring and controlling assets or resources

that can help the company achieve a competitive advantage.[33] Using the resource-based view, for example, a transportation company might decide to invest in radio-frequency technology to tag and trace products as they move from one location to another.

Threat of New Entrants

The threat of new entrants is another important force leading an organization to seek competitive advantage. A threat exists when entry and exit costs to the industry are low and the technology needed to start and maintain the business is commonly available. For example, consider a small restaurant. The owner does not require millions of dollars to start the business, food costs do not go down substantially for large volumes, and food processing and preparation equipment is commonly available. When the threat of new market entrants is high, the desire to seek and maintain competitive advantage to dissuade new market entrants is usually high.

Threat of Substitute Products and Services

The more consumers are able to obtain similar products and services that satisfy their needs, the more likely firms are to try to establish competitive advantage. For example, consider the photographic industry. When digital cameras started to become more popular, traditional film companies had to respond to stay competitive and profitable. Traditional film companies, such as Kodak and others, started to offer additional products and enhanced services, including digital cameras, the ability to produce digital images from traditional film cameras, and Web sites that could be used to store and view pictures.

In the restaurant industry, competition is fierce because entry costs are low. So, a small restaurant that enters the market can be a threat to existing restaurants.

(Source: © Owen Franken/CORBIS.)

Bargaining Power of Customers and Suppliers

Large buyers tend to exert significant influence on a firm. This influence can be diminished if the buyers are unable to use the threat of going elsewhere. Suppliers can help an organization obtain a competitive advantage. In some cases, suppliers have entered into strategic alliances with firms. When they do so, suppliers act as if they were part of the company. Suppliers and companies can use telecommunications to link their computers and personnel to obtain fast reaction times and the ability to get the parts or supplies when they are needed to satisfy customers. Government agencies are also using strategic alliances.[34] The investigative units of the U.S. Customs and Immigration and Naturalization Service entered into a strategic alliance to streamline operations and to place all investigative operations into a single department.

Strategic Planning for Competitive Advantage

To be competitive, a company must be fast, nimble, flexible, innovative, productive, economical, and customer oriented.[35] It must also align its IS strategy with general business strategies and objectives.[36] Given the five market forces just mentioned, Porter proposed three general strategies to attain competitive advantage: altering the industry structure, creating new products and services, and improving existing product lines and services. Subsequent research into the use of information systems to help an organization achieve a competitive advantage has confirmed and extended Porter's original work to include additional strategies—such as forming alliances with other companies, developing a niche market, maintaining competitive cost, and creating product differentiation.[37]

Altering the Industry Structure

Altering the industry structure is the process of changing the industry to become more favorable to the company or organization. The introduction of low-fare airline carriers, such as Southwest Airlines, has forever changed the airline industry, making it difficult for traditional airline companies to make high profit margins. To fight back, airline companies such as Delta are launching their own low-fare flights.[38] Delta claims that its Song airline will be one of the first "all digital" airlines. The approach will include a host of services on the flights, including entertainment, satellite TV, and many similar services.

A company can also attempt to create barriers to new companies entering the industry. An established organization that acquires expensive new technology to provide better

strategic alliance (strategic partnership)
An agreement between two or more companies that involves the joint production and distribution of goods and services.

products and services can discourage new companies from getting into the marketplace. Creating strategic alliances can also have this effect. A **strategic alliance**, also called a **strategic partnership**, is an agreement between two or more companies that involves the joint production and distribution of goods and services. Samsung Electronics and Echelon Corporation, for example, signed a strategic alliance agreement to develop and market electronic devices that can be connected to each other and the Internet.[39] The alliance is oriented to the home networking market.

Creating New Products and Services

Creating new products and services is always an approach that can help a firm gain a competitive advantage, and it is especially true of the computer industry and other high-tech businesses. If an organization does not introduce new products and services every few months, the company can quickly stagnate, lose market share, and decline. Companies that stay on top are constantly developing new products and services. A large U.S. credit-reporting agency, for example, can use its information system to help it explore new products and services in different markets. Delta Airlines created a new service by installing hundreds of self-service kiosks to reduce customer check-in times. The new kiosks allow Delta customers to check in, get boarding passes, change seats, and sign up for standby flights or upgrades. On average, the kiosks save flyers from 5 to 15 minutes for each check-in at an airport terminal.[40]

Improving Existing Product Lines and Services

Improving existing product lines and services is another approach to staying competitive. The improvements can be either real or perceived. Manufacturers of household products are always advertising new and improved products. In some cases, the improvements are more perceived than real refinements; usually, only minor changes are made to the existing product. Many food and beverage companies are introducing "Healthy" and "Low-Carb" product lines. Some companies are now starting to put radio-frequency ID (RFID) tags on their products to identify them and track their location as they move from one location to another.[41] Customers and managers can instantly locate products as they are shipped from suppliers, to the company, to warehouses, and, finally, to customers. In another case, Metro, the third largest retail store in Europe, used portable computers to show shoppers where products are located in the store and to display discounted prices and any specials.[42]

Using Information Systems for Strategic Purposes

In simplest terms, competitive advantage is usually embodied in either a product or service that has the most added value to consumers and that is unavailable from the competition or in an internal system that delivers benefits to a firm not enjoyed by its competition. Although it can be difficult to develop information systems to provide a competitive advantage, some organizations have done so with success. A classic example is SABRE, a sophisticated computerized reservation system installed by American Airlines and one of the first information systems recognized for providing competitive advantage. Travel agents used this system for rapid access to flight information, offering travelers reservations, seat assignments, and ticketing. The travel agents also achieved an efficiency benefit from the SABRE system. Because SABRE displayed American Airline flights whenever possible, it also gave the airline a long-term, significant competitive advantage. Today, SABRE is aggressively seeking a competitive advantage by investing heavily in e-commerce technology and developing Internet travel sites. It invested more than $200 million in technology recently. Much of the investment was in the company's Travelocity.com site (the second largest online travel agency) and GetThere.com.[43] Increasingly, companies are using e-commerce as part of a strategy to achieve a competitive advantage. Table 1.5 lists several examples of how companies have attempted to gain a competitive advantage.

Table 1.5

Competitive Advantage Factors and Strategies

Factors That Lead to Attainment of a Competitive Advantage	Alter Industry Structure	Create New Products and Services	Improve Existing Product Lines and Services
Rivalry among existing competitors	Netflix changes the industry structure with its use of online ordering for DVDs.	Apple, Dell, and other PC makers develop computers that excel at downloading Internet music and playing the music on high-quality speakers.	Food and beverage companies offer "healthy" and "light" product lines.
Threat of new entrants	HP and Compaq merge to form a large Internet and media company.	Apple Computer introduces an easy-to-use iMac computer that can be used to create and edit home movies.	Starbucks offers new coffee flavors at premium prices.
Threat of substitute products and services	Ameritrade and other discount stockbrokers offer low fees and research on the Internet.	Wal-Mart uses technology to monitor inventory and product sales to determine the best mix of products and services to offer at various stores.	Cosmetic companies add sunscreen to their product lines.
Bargaining power of buyers	Ford, GM, and others require that suppliers locate near their manufacturing facilities.	Investors and traders of the Chicago Board of Trade (CBOT) put pressure on the institution to implement electronic trading.	Retail clothing stores require manufacturing companies to reduce order lead times and improve materials used in the clothing.
Bargaining power of suppliers	American Airlines develops SABRE, a comprehensive travel program used to book airline, car rental, and other reservations.	Broadcom develops a chip for wireless computing used in notebook PCs from Apple, Dell, Hewlett-Packard, and Gateway.	Hayworth, a supplier of office furniture, has a computerized-design tool that helps it design new office systems and products.

PERFORMANCE-BASED INFORMATION SYSTEMS

At least three major stages have occurred in the business use of information systems. The first stage started in the 1960s and was oriented toward cost reduction and productivity. This stage generally ignored the revenue side, not looking for opportunities to increase sales via the use of information systems. The second stage started in the 1980s and was defined by Porter and others. It was oriented toward gaining a competitive advantage. In many cases, companies spent large amounts on information systems and ignored the costs. Today, we are seeing a shift from strategic management to performance-based management in many IS organizations.[44] This third stage carefully considers both strategic advantage and costs. This stage uses productivity, return on investment (ROI), net present value, and other measures of performance. Figure 1.15 illustrates these stages. This balanced approach attempts to reduce costs and increase revenues. Aviall, an aviation parts company, for example, invested over $3 million in a new Web site—Aviall.com—that slashed inventory ordering costs from $9 to $.39 per order.[45]

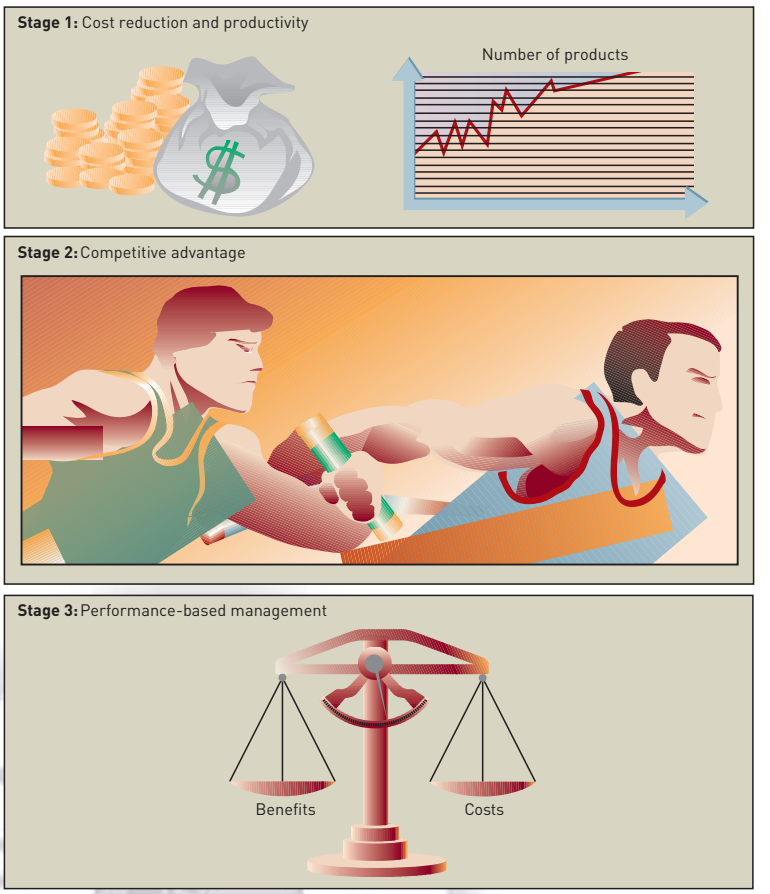
Productivity

Developing information systems that measure and control productivity is a key element for most organizations. **Productivity** is a measure of the output achieved divided by the input required. A higher level of output for a given level of input means greater productivity; a lower level of output for a given level of input means lower productivity. Consider a tax

productivity
A measure of the output achieved divided by the input required.

Figure 1.15

Three Stages in the Business Use of Information Systems



preparation firm, where productivity can be measured by the hours spent on preparing tax returns divided by the total hours the employee worked. For example, in a 40-hour week, an employee may have spent 30 hours preparing tax returns. The productivity is thus equal to 30/40, or 75 percent. With administrative and other duties, a productivity level of 75 might be excellent. The numbers assigned to productivity levels are not always based on labor hours—productivity can be based on factors such as the amount of raw materials used, resulting quality, or time to produce the goods or service. In any case, what is important is not the value of the productivity number but how it compares with other time periods, settings, and organizations.

Productivity = (Output/Input) × 100%

After a basic level of productivity is measured, an information system can monitor and compare it over time to see whether productivity is increasing. Then, corrective action can be taken if productivity drops below certain levels. In addition to measuring productivity, an information system can also be used within a process to significantly increase productivity. Thus, improved productivity can result in faster customer response, lower costs, and increased customer satisfaction. See the "Information Systems @ Work" feature for an example of how one company used information systems to streamline its business processes.

INFORMATION SYSTEMS @ WORK

OneBeacon Focuses on Information Systems

"It's not uncommon for insurers to have multiple policy systems that are 15 or 20 years old and don't talk to one another," says Larry Goldberg, senior vice president of Sapiens Americas, a leading insurance IS provider. OneBeacon Insurance Group was in such a predicament. Until recently, the process for policy writing took OneBeacon agents a long, arduous week. Field agents filled out application forms and faxed them to the main office. Data-entry clerks would then input the information into a system. The system would provide a quotation, which was then relayed to the agent via telephone. If the customer decided to accept the quote, she would have to wait one week before the coverage would be issued.

This wasteful system was not only time-consuming but also expensive. OneBeacon was losing $50 million a month due to inefficiencies. The expense of the inefficiencies was passed on to customers in the form of higher premiums. The cost of creating new policies was so high that OneBeacon all but gave up its efforts to insure small businesses; the cost of the quotes didn't justify the return.

Under the management of a new chief information officer (CIO), Mike Natan, OneBeacon restructured its business. The change was focused around a new $15 million Web-based policy administration system purchased from Sapiens International. The system resides on servers at the insurance company's home office and is accessed from Web-based applications downloaded to an agent's desktop or notebook computers. Agents use standard Web forms to send customer information to company headquarters, and the system scores the request for risk and approves or disapproves the policy. Any questionable applications are flagged and forwarded for human inspection. Quotes are provided in a matter of seconds, and a policy is issued within 15 minutes. What used to take a week can now be accomplished in the time it takes to sip a cup of coffee. What's more, the cost of providing a quote was more than halved—from $15 per policy to $7.

The new system has allowed OneBeacon once again to offer insurance coverage to small commercial businesses. Between the money saved by the new system and the additional revenue coming in from small businesses, OneBeacon expects to realize a return on its investment in less than a year.

The change in information systems has led to changes in organizational structure. The company has reduced the number of data-entry clerks—those who collected faxed quotation requests and entered them into the old system. But computers aren't replacing human employees at OneBeacon. The company has been hiring hundreds of agents to keep up with the increased demand for its insurance policies. The end result is that OneBeacon has moved its workforce from its back office to the field, where they can generate more revenue for the company rather than burn it up through inefficiencies.

OneBeacon's project follows an industry trend of automating the underwriting process, says analyst Janie Bisker. "You're going to see more of these automated systems," he says. "The general idea is to reduce cost but also increase accuracy and the convenience for the broker and consumer." Where once brokers waited uncomfortably for quotations while customers lost patience, requests are now filled almost instantaneously. The uninterrupted flow of the sale allows brokers to hold a customer's attention and build momentum for increased sales.

Discussion Questions

1. How does OneBeacon's new system improve the productivity of its field agents?
2. How does the new system improve OneBeacon's standing in terms of return on investment, earnings growth, market share, and customer satisfaction?

Critical Thinking Questions

3. If you were a field agent for OneBeacon, what type of information would you need delivered to your portable computer in order to write a policy?
4. It took a considerable amount of courage for OneBeacon to agree to invest $15 million in a new system and reengineer its business. If you were CIO Mike Natan, how would you have sold the company on your idea for the new system in light of what you have learned about performance-based information systems?

SOURCES: Lucas Mearian, "Sticking to Policy at OneBeacon," *Computerworld*, July 7, 2003, *www.computerworld.com*; Matt Glynn, "OneBeacon Adds 130 Jobs, Doubles Space in Amherst," *The Buffalo News,* August 5, 2003, Business Section, p. B6; OneBeacon Web site, *www.onebeacon.com*, accessed January 23, 2004.

In the late 1980s and early 1990s, overall productivity did not seem to increase with increases in investments in information systems. Often called the *productivity paradox*, this situation troubled many economists who were expecting to see dramatic productivity gains.[46] In the early 2000s, however, productivity again seemed on the rise. According to IDC, a marketing research company, investments in information systems will contribute an estimated 80 percent of the productivity gains from 2002 through 2010.[47]

Return on Investment and the Value of Information Systems

return on investment (ROI)
One measure of IS value that investigates the additional profits or benefits that are generated as a percentage of the investment in information systems technology.

One measure of IS value is **return on investment** (**ROI**). This measure investigates the additional profits or benefits that are generated as a percentage of the investment in IS technology. A small business that generates an additional profit of $20,000 for the year as a result of an investment of $100,000 for additional computer equipment and software would have a return on investment of 20 percent ($20,000/$100,000). One study investigated the ROI for computer-related training and certification.[48] According to the study, the Microsoft Certified Solution Developer for Microsoft.NET and the Microsoft Certified Database Administrator received ROI values of 170 percent and 122 percent for large organizations. For smaller organizations, the Check Point Certified Security Administrator received an ROI value of 98 percent.

Because of the importance of ROI, many computer companies provide ROI calculators to potential customers. ROI calculators are typically found on a vendor's Web site and can be used to estimate returns.

Ace Hardware's new Web-based inventory management system benefits customers by speeding checkout time. The new system enables real-time viewing and tracking of sales data, replacing a week-long lag time under the old system.

(Source: AP/Wide World Photos.)

Earnings Growth

Another measure of IS value is the increase in profit, or earnings growth, it brings. For instance, suppose a mail-order company, after installing an order-processing system, had a total earnings growth of 15 percent compared with the previous year. Sales growth before the new ordering system was only about 8 percent annually. Assuming that nothing else affected sales, the earnings growth brought by the system, then, was 7 percent. Aviall, an aviation parts company, invested over $30 million in a new computer system to improve inventory control and earnings growth. According to the vice president of information services, "Our competitors thought we were insane. Some investors asked for my resignation." The investment in the new information system was very successful, however. Net earnings rose almost 75 percent.[49]

Market Share

Market share is the percentage of sales that one company's products or services have in relation to the total market. If installing a new online Internet catalog increases sales, it might help a company increase its market share by 20 percent.

Customer Awareness and Satisfaction

Although customer satisfaction can be difficult to quantify, about half of today's best global companies measure the performance of their information systems based on feedback from internal and external users. Some companies use surveys and questionnaires to determine whether the IS investment has increased customer awareness and satisfaction.

Total Cost of Ownership

total cost of ownership (TCO)
The measurement of the total cost of owning computer equipment, including desktop computers, networks, and large computers.

In addition to such measures as return on investment, earnings growth, market share, and customer satisfaction, some companies are also tracking total costs. One measure, developed by the Gartner Group is the **total cost of ownership** (**TCO**). This approach breaks total costs into such areas as the cost to acquire the technology, technical support, administrative costs, and end-user operations. Other costs in TCO include retooling and training costs. TCO can be used to get a more accurate estimate of the total costs for systems that range from small PCs to large mainframe systems. Market research groups often use TCO to compare different

products and services. For example, a survey of large global enterprises ranked messaging and collaboration software products using the TCO model.[50] The survey analyzed acquisition, maintenance, administration, upgrading, downtime, and training costs. In this survey, Oracle had the lowest TCO of about $65 per user for messaging and collaboration.

CAREERS IN INFORMATION SYSTEMS

Realizing the benefits of any information system requires competent and motivated information systems personnel, and many companies offer excellent job opportunities. Numerous schools have degree programs with such titles as information systems, computer information systems, and management information systems. These programs are typically in business schools and within computer science departments. Degrees in information systems have provided high starting salaries for many students after graduation from college. In addition, students are increasingly looking at business degrees with a global or international orientation.[51]

Many companies, such as FedEx, are joining with colleges and universities to help prepare students for careers.[52] FedEx has opened its $23 million four-story FedEx Technology Institute in Memphis, Tennessee, part of the University of Memphis. Programs include Managing Emerging Technology, Supply Chain Management, Multimedia Arts, Digital Economic and Regional Development, Spatial Analysis, Artificial Intelligence, Life Sciences, and Advanced Learning.

Today, companies are rebounding and looking for IS talent. Online job listings for IS positions, for example, increased in 2003.[53] Demand for IS professionals has grown also in nonprofit organizations and in government. In addition to salary, IS workers seek paid vacation, health insurance, stock options, and flexible hours as important job factors. A study done by *Computerworld* listed the top places to work in information systems (see Table 1.6).

Table 1.6

The Top Places to Work in Information Systems

(Source: Data from Steve Ulfelder, "100 Best Places to Work in IT," *Computerworld*, June 9, 2003, p. 23.)

Company Name	Business
Hershey Foods Corp.	Maker of candies
Harley-Davidson, Inc.	Motorcycle manufacturer
University of Miami	Florida university
Network Appliances, Inc.	Hardware storage company
Vision Service Plan	Eye-care provider
Harrah's Entertainment	Casino operator
Saint Luke's Health System	Nonprofit health organization, including eight hospitals
Rich Products, Inc.	Family-owned food company
Discover Financial Services	Credit card company
Software Performance Systems, Inc.	Provider of financial management software

On the job, computer systems are also making IS professionals' work easier. Called *autonomics* by some, the use of advanced computer systems can help IS professionals spend less time maintaining existing systems and more time solving problems or looking for new opportunities. Colgate-Palmolive Co., for example, uses autonomics to keep its computer systems running well in more than 50 countries.

Opportunities in information systems are not confined to single countries. Some companies seek skilled IS employees from foreign countries, including Russia and India. The U.S. H-1B and L-1 visa programs seek to allow skilled employees from foreign lands into

the United States. But not everyone is happy with the H-1B program. Some companies may be firing U.S. workers and hiring less-expensive workers under the H-1B program. Because of a recent difficult economy, some companies may be abusing the H-1B visa program.[54] The L-1 visa program is often used for intracompany transfers for multinational companies. Some people fear, however, that the L-1 visa program could also be used to bring cheap IS personnel into the United States to replace more expensive American workers.[55] The Internet also makes it easier to export IS jobs to other countries.[56] Procter & Gamble estimates that it has reduced costs by about $1 billion by exporting IS jobs to Costa Rica, the Philippines, and Great Britain.

Roles, Functions, and Careers in the IS Department

Information systems personnel typically work in an IS department that employs Web developers, computer programmers, systems analysts, computer operators, and a number of other personnel. They may also work in other functional departments or areas in a support capacity. In addition to technical skills, IS personnel also need skills in written and verbal communication, an understanding of organizations and the way they operate, and the ability to work with people. According to George Voutes, enterprise technology programs manager for Deutsche Asset Management Technology, "We have to get away from strict programming and systems development. Those are skills to get into the field, but we have to train our technology people more like business people and arm them with strong communications skills."[57] IS personnel also need skills to work in groups.[58] Today, many good business and computer science schools require business and communications skills of their graduates. In general, IS personnel are charged with maintaining the broadest perspective on organizational goals. For most medium- to large-sized organizations, information resources are typically managed through an IS department. In smaller businesses, one or more people might manage information resources, with support from outside services—outsourcing. Outsourcing is also popular with larger organizations. According to a study by Gartner, Inc., a technology consulting company, "By 2004, 80 percent of U.S. executive boardrooms will have discussed offshore outsourcing, and more than 40 percent will have completed some type of pilot."[59] As shown in Figure 1.16, the IS organization has three primary responsibilities: operations, systems development, and support.

Operations

The operations component of a typical IS department focuses on the use of information systems in corporate or business unit computer facilities. It tends to focus more on the *efficiency* of information system functions rather than their effectiveness.

The primary function of a system operator is to run and maintain IS equipment. System operators are responsible for starting, stopping, and correctly operating mainframe systems, networks, tape drives, disk devices, printers, and so on. System operators are typically trained at technical schools or through on-the-job experience. Other operations include scheduling, hardware maintenance, and preparation of input and output. Data-entry operators convert data into a form the computer system can use. They can use terminals or other devices to enter business transactions, such as sales orders and payroll data. Increasingly, data entry is being automated—captured at the source of the transaction rather than being entered later. In addition, companies might have local area network and Web or Internet operators who are responsible for running the local network and any Internet sites the company might have.

Systems Development

The systems development component of a typical IS department focuses on specific development projects and ongoing maintenance and review. Systems analysts and programmers, for example, focus on these concerns. The role of a systems analyst is multifaceted. Systems analysts help users determine what outputs they need from the system and construct the plans needed to develop the necessary programs that produce these outputs. Systems analysts then work with one or more programmers to ensure that the appropriate programs are purchased, modified from existing programs, or developed. The major responsibility of a computer programmer is to use the plans developed by

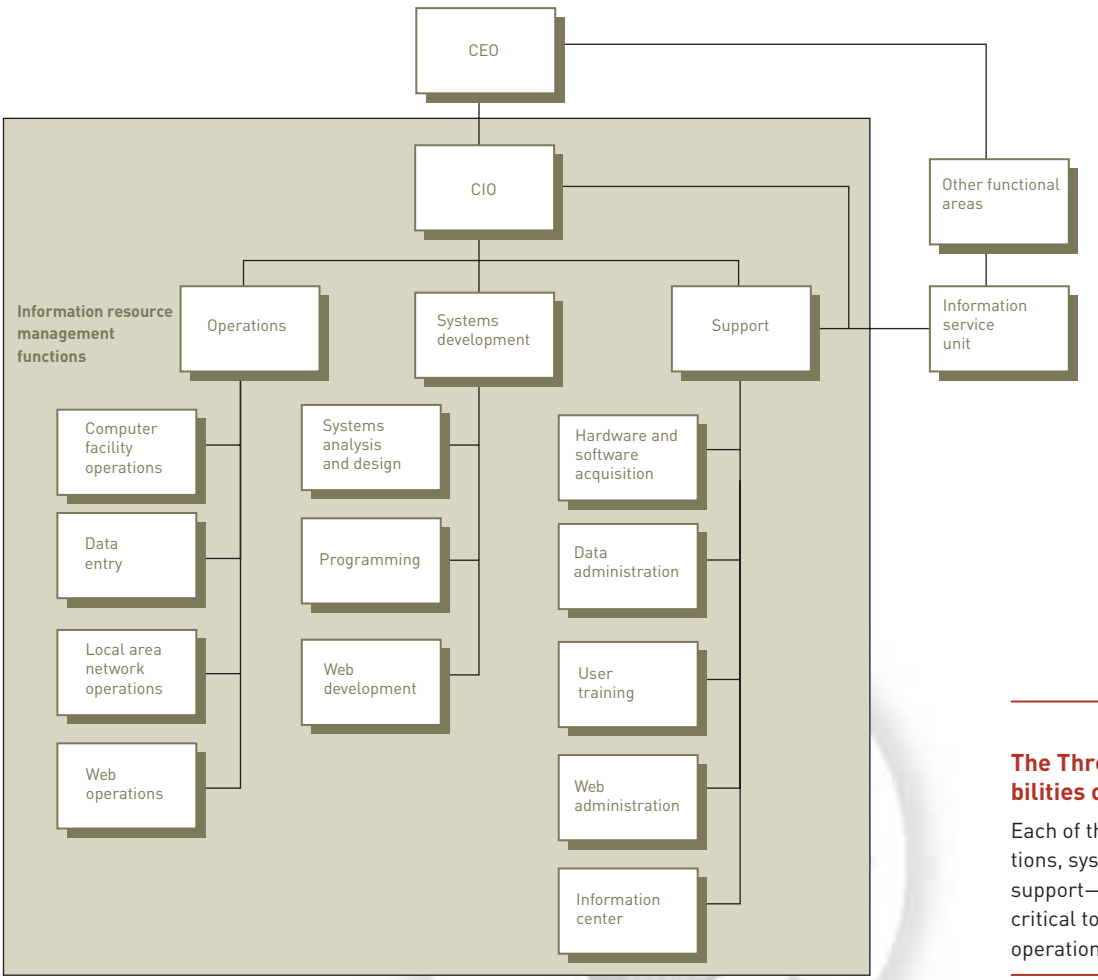


Figure 1.16

The Three Primary Responsibilities of Information Systems

Each of these elements—operations, systems development, and support—contains subelements critical to the efficient and effective operation of the organization.

the systems analyst to develop or adapt one or more computer programs that produce the desired outputs. The main focus of systems analysts and programmers is to achieve and maintain IS effectiveness. To help companies select the best analysts and programmers, companies such as TopCoder offer tests to evaluate the proficiency and competence of existing IS employees or job candidates. Some companies, however, are skeptical of the usefulness of these types of tests.[60]

Support

The support component of a typical IS department focuses on providing user assistance in the areas of hardware and software acquisition and use, data administration, user training and assistance, and Web administration. In many cases, the support function is delivered through an information center.

A database administrator focuses on planning, policies, and procedures regarding the use of corporate data and information. For example, database administrators develop and disseminate information about the corporate databases for developers of IS applications. In addition, the database administrator is charged with monitoring and controlling database use.

User training is a key to get the most from any information system. The support area ensures that appropriate training is available to users. Training can be provided by internal staff or from external sources.

Web administration is another key area of the support function. With the increased use of the Internet and corporate Web sites, Web administrators are sometimes asked to regulate and monitor Internet use by employees and managers to ensure that it is authorized and appropriate. Web administrators also are responsible for maintaining the corporate Web site. Keeping corporate Web sites accurate and current can require substantial resources.

information center
A support function that provides users with assistance, training, application development, documentation, equipment selection and setup, standards, technical assistance, and troubleshooting.

information service unit
A miniature IS department.

The support component typically operates the information center. An **information center** provides users with assistance, training, application development, documentation, equipment selection and setup, standards, technical assistance, and troubleshooting. Although many firms have attempted to phase out information centers, others have changed the focus of this function from technical training to helping users find ways to maximize the benefits of the information resource.

Information Service Units

An **information service unit** is basically a miniature IS department attached and directly reporting to a functional area. Notice the information service unit shown in Figure 1.16. Even though this unit is usually staffed by IS professionals, the project assignments and the resources necessary to accomplish these projects are provided by the functional area to which it reports. Depending on the policies of the organization, the salaries of IS professionals staffing the information service unit might be budgeted to either the IS department or the functional area.

Typical IS Titles and Functions

The organizational chart shown in Figure 1.16 is a simplified model of an IS department in a typical medium-sized or large organization. Many organizations have even larger departments, with increasingly specialized positions, such as librarian, quality assurance manager, and the like. Smaller firms often combine the roles depicted in Figure 1.16 into fewer formal positions.

The Chief Information Officer

The overall role of the chief information officer (CIO) is to employ an IS department's equipment and personnel in a manner that will help the organization attain its goals. The CIO is usually a manager at the vice-presidential level concerned with the overall needs of the organization. He or she is responsible for corporate-wide policy, planning, management, and acquisition of information systems. Some of the CIO's top concerns include integrating IS operations with corporate strategies, keeping up with the rapid pace of technology, and defining and assessing the value of systems development projects. The high level of the CIO position is consistent with the idea that information is one of the organization's most important resources. This individual works with other high-level officers of an organization, including the chief financial officer (CFO) and the chief executive officer (CEO), in managing and controlling total corporate resources. CIOs must work closely with advisory committees, stressing effectiveness and teamwork and viewing information systems as an integral part of the organization's business processes—not an adjunct to the organization. Thus, CIOs need both technical and business skills. For federal agencies, the Clinger-Cohen Act of 1996 required the establishment of a CIO to coordinate the purchase and management of information systems.[61]

Depending on the size of the IS department, there might be several people at senior IS managerial levels. Some of the job titles associated with IS management are the CIO, vice president of information systems, manager of information systems, and chief technology officer (CTO). A central role of all these individuals is to communicate with other areas of the organization to determine changing needs. Often, these individuals are part of an advisory or steering committee that helps the CIO and other IS managers with their decisions about the use of information systems. Together they can best decide what information systems will support corporate goals. The CTO, for example, typically works under a CIO and specializes in hardware and related equipment and technology.[62] According to John Voeller, a CTO for the Black & Veatch engineering and construction company, "I don't just look at the technology of my enterprise. I look far beyond information technology at nanotechnologies, biotech, and other domains." The CTO position also exists in federal agencies. According to Debra Stouffer, CTO of the Environmental Protection Agency (EPA), "I can carve out what the CTO position will be. I was very attracted to the mission—protecting human health and safeguarding the environment."[63]

LAN Administrators

Local area network (LAN) administrators set up and manage the network hardware, software, and security processes. They manage the addition of new users, software, and devices to the network. They isolate and fix operations problems. LAN administrators are in high demand and often solve both technical and nontechnical problems.

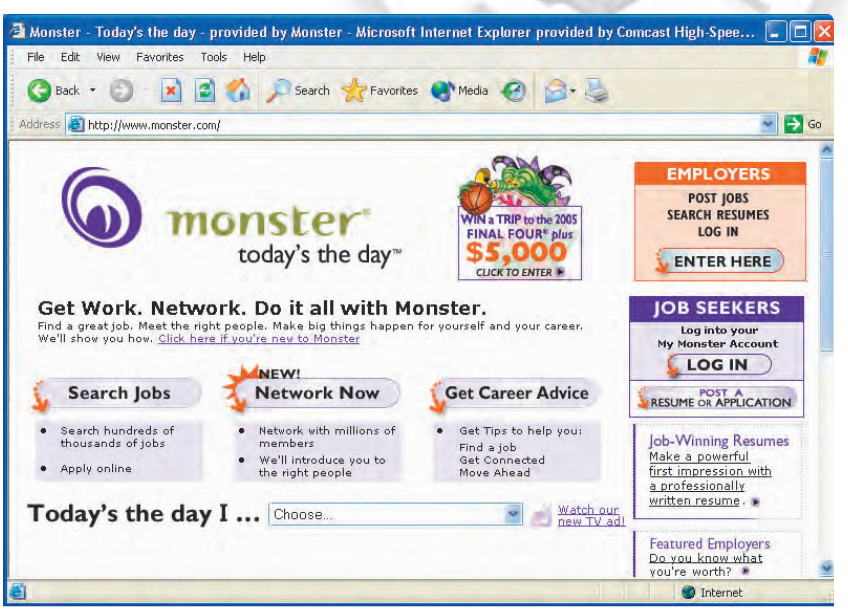
Internet Careers

The recent bankruptcy of some Internet start-up companies, called the *dot-gone era* by some, has resulted in layoffs for some firms. Some executives of these bankrupt start-up Internet companies lost hundreds of millions of dollars in a few months. Yet, the growth in the use of the Internet to conduct business continues and has caused a steady need for skilled personnel to develop and coordinate Internet usage. As seen in Figure 1.16, these careers are in the areas of Web operations, Web development, and Web administration. As with other areas in information systems, there are a number of top-level administrative jobs related to the Internet. These career opportunities are with traditional companies and companies that specialize in the Internet.

Internet jobs within a traditional company include Internet strategists and administrators, Internet systems developers, Internet programmers, and Internet or Web site operators. The Internet has become so important to some companies that some have suggested a new position, chief Internet officer, with responsibilities and salary similar to the CIO's.

In addition to traditional companies, many exciting career opportunities exist in companies that offer products and services over the Internet. These companies include Amazon.com, Yahoo!, eBay, and many others. Systest, for example, specializes in finding and eliminating digital bugs that could halt the operation of a computer system.

A number of Internet sites, such as Monster.com, post job opportunities for Internet careers and more traditional careers. Most large companies have job opportunities listed on their Internet sites. These sites allow prospective job hunters to browse job opportunities, job locations, salaries, benefits, and other factors. In addition, some of these sites allow job hunters to post their résumé.



Internet job sites such as Monster.com allow job hunters to browse job opportunities and post their résumés.

certification
A process for testing skills and knowledge that results in a statement by the certifying authority that says an individual is capable of performing a particular kind of job.

Often, the people filling IS roles have completed some form of certification. **Certification** is a process for testing skills and knowledge resulting in an endorsement by the certifying authority that an individual is capable of performing a particular job. Certification frequently involves specific, vendor-provided or vendor-endorsed coursework. A number of popular certification programs are available, including Novell Certified Network Engineer, Microsoft Certified Professional Systems Engineer, Certified Project Manager, and others. Microsoft, for example, offers Certified Systems Engineer: Security on Microsoft Windows that requires passing six exams.[64] The Certified Information Systems Security Professional (CISSP) is also becoming increasingly important to companies. The federal government is helping military personnel get IS certification. Some GI bill beneficiaries, for example, can now be reimbursed for technology certification through the Computing Technology Industry Association.

Other IS Careers

Many other exciting IS careers are also available. With the increase in computer attacks, there are new and exciting careers in security and fraud detection and prevention. Insurance fraud and vehicle theft are no longer perpetrated primarily by small-time crooks but by organized crime rings using computers to falsify claim receipts, ship stolen vehicles throughout the world, and commit identity theft and fraud. The National Insurance Crime Bureau, a nonprofit organization supported by roughly 1,000 property and casualty insurance companies, uses computers to join forces with special investigation units and law enforcement agencies, as well as to conduct online fraud-fighting training to investigate and prevent these types of crimes.

In addition to working for an IS department in an organization, IS personnel can work for one of the large consulting firms, such as Accenture, IBM, EDS, and others. These jobs often entail a large amount of travel, because consultants are assigned to work on various projects wherever the client is. Such roles require excellent people and project management skills in addition to IS technical skills.

Other IS career opportunities also exist, including being employed by a hardware or software vendor developing or selling products. Such a role enables an individual to work on the cutting edge of technology, which can be extremely challenging and exciting! As some computer companies cut their services to customers, new companies are being formed to fill the need. With names such as Speak With a Geek and the Geek Squad, these companies are helping people and organizations with their computer-related problems that computer vendors are no longer solving.

SUMMARY

Principle

The value of information is directly linked to how it helps decision makers achieve the organization's goals.

Data consists of raw facts; information is data transformed into a meaningful form. The process of defining relationships between data requires knowledge. Knowledge is an awareness and understanding of a set of information and the ways that information can be made useful to support a specific task. To be valuable, information must have several characteristics: It should be accurate, complete, economical to produce, flexible, reliable, relevant, simple to understand, timely, verifiable, accessible, and secure. The value of information is directly linked to how it helps people achieve their organization's goals.

Information systems are sets of interrelated elements that collect (input), manipulate (process) and store, and disseminate (output) data and information. Input is the activity of capturing and gathering new data; processing involves converting or transforming data into useful outputs; and output involves producing useful information. Feedback is the output that is used to make adjustments or changes to input or processing activities. The components of a computer-based information system include hardware, software, databases, telecommunications and networks, people, and procedures.

Principle

Knowing the potential impact of information systems and having the ability to put this knowledge to work can result in a successful personal career, organizations that reach their goals, and a society with a higher quality of life.

Information systems play an important role in today's businesses and society. The key to understanding the existing variety of systems begins with learning their fundamentals. The types of systems used within organizations can be classified into four basic groups: (1) e-commerce and m-commerce, (2) TPS and ERP, (3) MIS and DSS, and (4) specialized business information systems.

E-commerce involves any business transaction executed electronically between parties such as companies (business-to-business, B2B), consumers and other consumers (consumer-to-consumer, C2C), companies and consumers (business-to-consumer, B2C), business and the public sector, and consumers and the public sector. The major volume of e-commerce and its fastest-growing segment is business-to-business transactions. Mobile commerce (m-commerce) is transactions conducted anywhere, anytime using handheld computers, portable phones, laptop computers connected to a network, and other mobile devices.

The most fundamental system is the transaction processing system (TPS). A transaction is any business-related exchange. The TPS handles the large volume of business transactions that occur daily within an organization. TPSs include order processing, purchasing, accounting, and related systems. An enterprise resource planning (ERP) system is a set of integrated programs that is capable of managing a company's vital business operations for an entire multisite, global organization.

A management information system (MIS) uses the information from a TPS to generate information useful for management decision making. The focus of an MIS is primarily on operational efficiency. A decision support system (DSS) is an organized collection of people, procedures, databases, and devices used to support problem-specific decision making. The DSS differs from an MIS in the support given to users, the decision emphasis, the development and approach, and the system components, speed, and output. The specialized business information systems include artificial intelligence systems, expert systems, and virtual reality systems.

Principle

System users, business managers, and information systems professionals must work together to build a successful information system.

Systems development is the activity of creating or modifying existing business systems. The goal of the systems investigation is to gain a clear understanding of the problem to be solved or opportunity to be addressed. If the decision is to continue with the solution, the next step, systems analysis, defines the problems and opportunities of the existing system. Systems design determines how the new system will work to meet the business needs defined during systems analysis. Systems implementation involves creating or acquiring the various system components (hardware, software, databases, etc.) defined in the design step, assembling them, and putting the new system into operation. The purpose of systems maintenance and review is to check and modify the system so that it continues to meet changing business needs.

Principle

The use of information systems to add value to the organization can also give an organization a competitive advantage.

An organization is a formal collection of people and various other resources established to accomplish a set of goals. The primary goal of a for-profit organization is to maximize shareholder value. Nonprofit organizations include social groups, religious groups, universities, and other organizations that do not have profit as the primary goal. Organizations are systems with inputs, transformation mechanisms, and outputs.

Value-added processes increase the relative worth of the combined inputs on their way to becoming final outputs of the organization. The value chain is a series (chain) of activities that includes (1) inbound logistics, (2) warehouse and storage, (3) production, (4) finished product storage, (5) outbound logistics, (6) marketing and sales, and (7) customer service.

Supply chain management (SCM) helps determine what supplies are required, what quantities are needed to meet customer demand, how the supplies are to be processed (manufactured) into finished goods and services, and how the shipment of supplies and products to customers is to be scheduled, monitored, and controlled. Customer relationship management (CRM) programs help a company manage all aspects of customer encounters, including marketing and advertising, sales, customer service after the sale, and programs to help keep and retain loyal customers.

Organizations use information systems to support organizational goals. Because information systems typically are designed to improve productivity, methods for measuring the system's impact on productivity should be devised.

Organizational culture and change are important internal issues that affect most organizations. Organizational culture consists of the major understandings and assumptions for a business, a corporation, or an organization. Organizational change deals with how for-profit and nonprofit organizations plan for, implement, and handle change.

The extent to which technology is used throughout an organization is a function of technology diffusion, infusion, and acceptance. Technology diffusion is a measure of how widely technology is in place throughout an organization. Technology infusion is the extent to which technology

permeates an area or department. The technology acceptance model (TAM) investigates factors, such as the perceived usefulness of the technology, the ease of use of the technology, the quality of the information system, and the degree to which the organization supports the use of the information system, to predict IS usage and performance.

Competitive advantage is usually embodied in either a product or service that has the most added value to consumers and that is unavailable from the competition or in an internal system that delivers benefits to a firm not enjoyed by its competition. The five-forces model covers factors that lead firms to seek competitive advantage: the rivalry among existing competitors, the threat of new market entrants, the threat of substitute products and services, the bargaining power of buyers, and the bargaining power of suppliers. Three strategies to address these factors and to attain competitive advantage include altering the industry structure, creating new products and services, and improving existing product lines and services.

Developing information systems that measure and control productivity is a key element for most organizations. A useful measure of the value of an IS project is return on investment (ROI). This measure investigates the additional profits or benefits that are generated as a percentage of the investment in IS technology. Total cost of ownership (TCO) can also be a useful measure.

Principle

Information systems personnel are the key to unlocking the potential of any new or modified system.

Information systems personnel typically work in an IS department that employs a chief information officer, systems analysts, computer programmers, computer operators, and a number of other people. The overall role of the chief information officer (CIO) is to employ an IS department's equipment and personnel in a manner that will help the organization attain its goals. Systems analysts help users determine what outputs they need from the system and construct the plans for developing the necessary programs that produce these outputs. Systems analysts then work with one or more programmers to ensure that the appropriate programs are purchased, modified from existing programs, or developed. The major responsibility of a computer programmer is to use the plans developed by the systems analyst to develop or adapt one or more computer programs that produce the desired outputs. Computer operators are responsible for starting, stopping, and correctly operating mainframe systems, networks, tape drives, disk devices, printers, and so on. LAN administrators set up and manage the network hardware, software, and security processes. Trained personnel are also increasingly needed to set up and manage a company's Internet site. Information systems personnel might also work in other functional departments or areas in a support capacity for one of the large consulting firms. Another IS career opportunity is to be employed by a hardware or software vendor developing or selling products.

CHAPTER 1: SELF-ASSESSMENT TEST

The value of information is directly linked to how it helps decision makers achieve the organization's goals.

1. A (An) _____ is a set of interrelated components that collect, manipulate, and disseminate data and information and provide a feedback mechanism to meet an objective.
2. The value of data is measured by the increase in revenues. True or False?

Knowing the potential impact of information systems and having the ability to put this knowledge to work can result in a successful personal career, organizations that reach their goals, and a society with a higher quality of life.

3. A (An) _____ consists of hardware, software, databases, telecommunications, people, and procedures.
4. Computer programs that govern the operation of a computer system are called
   a. feedback
   b. feedforward
   c. software
   d. transaction processing system
5. Payroll and order processing are examples of a computerized management information system. True or False?

System users, business managers, and information systems professionals must work together to build a successful information system.

6. What involves creating or acquiring the various system components (hardware, software, databases, etc.) defined in the design step, assembling them, and putting the new system into operation?
   a. systems implementation
   b. systems review
   c. systems development
   d. systems design
7. _____ involves anytime, anywhere commerce that uses wireless communications.

8. _____ involves contracting with outside professional services to meet specific business needs.

The use of information systems to add value to the organization can also give an organization a competitive advantage.

9. _____ change can help an organization improve the raw materials supply, the production process, and the products and services offered by the organization.
10. Technology diffusion is a measure of how widely technology is spread throughout an organization. True or False?

Information systems personnel are the key to unlocking the potential of any new or modified system.

11. Who is involved in helping users determine what outputs they need and constructing the plans needed to produce these outputs?
    a. the CIO
    b. the applications programmer
    c. the systems programmer
    d. the systems analyst
12. The systems development component of a typical IS department focuses on specific development projects and ongoing maintenance and review. True or False?
13. The _____ is typically in charge of the information systems department or area in a company.

CHAPTER 1: SELF-ASSESSMENT TEST ANSWERS

(1) information system (2) False (3) computer-based information system (CBIS) (4) c (5) False (6) a (7) Mobile commerce (m-commerce) (8) Outsourcing (9) Sustaining (10) True (11) d (12) True (13) chief information officer (CIO)

REVIEW QUESTIONS

1. What are the components of any information system?
2. How would you distinguish data and information? Information and knowledge?
3. Identify at least six characteristics of valuable information.
4. What is a computer-based information system? What are its components?
5. What are the most common types of computer-based information systems used in business organizations today? Give an example of each.
6. What is the difference between e-commerce and m-commerce?
7. What are some of the benefits organizations seek to achieve through using information systems?
8. What is a value-added process? Give several examples.
9. What is the technology acceptance model (TAM)?
10. What are some general strategies employed by organizations to achieve competitive advantage?
11. Define the term *productivity*. Why is it difficult to measure the impact that investments in information systems have on productivity?
12. What is the productivity paradox?
13. What is the total cost of ownership?
14. What is the role of the systems analyst? What is the role of the programmer?
15. What is the operations component of a typical IS department?
16. What is the role of the chief information officer?

DISCUSSION QUESTIONS

1. Describe the "ideal" automated auto license plate renewal system for the drivers in your state. Describe the input, processing, output, and feedback associated with this system.
2. You have decided to open an Internet site to buy and sell used music CDs to other students. Describe the value chain for your new business.
3. How is it that useful information can vary widely from the quality attributes of valuable information?
4. What is the difference between an MIS and a DSS?
5. Discuss the potential use of virtual reality to enhance the learning experience for new automobile drivers. How might such a system operate? What are the benefits and potential drawbacks of such a system?
6. Discuss how information systems are linked to the business objectives of an organization.
7. You have been hired to work in the IS area of a manufacturing company that is starting to use the Internet to order parts from its suppliers and offer sales and support to its customers. What types of Internet positions would you expect to see at the company?
8. You have been asked to participate in the preparation of your company's strategic plan. Specifically, your task is to analyze the competitive marketplace using Porter's five-forces model. Prepare your analysis, using your knowledge

of a business you have worked for or have an interest in working for.

9. Based on the analysis you performed in the preceding discussion question, what possible strategies could your organization adopt to address these challenges? What role could information systems play in these strategies? Use Porter's strategies as a guide.
10. You have been hired as a sales representative for a sporting goods store. You would like the IS department to develop new software to give you reports on which customers are spending the most at your store. Describe your role in getting the new software developed. Describe the roles of the systems analysts and the computer programmers.
11. Imagine that you are the CIO for a large, multinational company. Outline a few of your key responsibilities.
12. What sort of IS position would be most appealing to you—working as a member of an IS organization, being a consultant, or working for an IS hardware or software vendor? Why?
13. What are your career goals and how can a computer-based information system be used to achieve them?

PROBLEM-SOLVING EXERCISES

1. Prepare a data disk and a backup disk for the problem-solving exercises and other computer-based assignments you will complete in this class. Create one directory or folder for each chapter in the textbook (you should have nine directories or folders). As you work through the problem-solving exercises and complete other work using the computer, save your assignments for each chapter in the appropriate directory or folder. On the label of each disk, be certain to include your name, course, and section. On one disk, write "Working Copy"; on the other, write "Backup."
2. Do some research to obtain estimates of the rate of growth of e-commerce and m-commerce. Use the plotting capabilities of your spreadsheet or graphics software to produce a bar chart of that growth over a number of years. Share your findings with the class.
3. For an industry of your choice, find the number of employees, total sales, total profits, and earnings growth rate of 15 firms. Using a database program, enter this information for the last year. Use the database to generate a report of the three companies with the highest earnings growth rate. Use your word processor to create a document that describes the 15 firms. What other measures would you use to determine which is the best company in terms of future profit potential?

TEAM ACTIVITIES

1. Before you can do a team activity, you need a team! The class members may self-select their teams, or the instructor may assign members to groups. After your group has been formed, meet and introduce yourselves to each other. You will need to find out the first name, hometown, major, and e-mail address and phone number of each member. Find out one interesting fact about each member of your team, as well. Come up with a name for your team. Put the information about each team member into a database and print enough copies for each team member and your instructor.
2. Have your team interview a company that recently introduced new technology. Write a brief report that describes the extent of technology infusion and diffusion.
3. Have your team research a firm that has achieved a competitive advantage. Write a brief report that describes how the company was able to achieve its competitive advantage.

WEB EXERCISES

1. Throughout this book, you will see how the Internet provides a vast amount of information to individuals and organizations. We will stress the World Wide Web, or simply the Web, which is an important part of the Internet. Most large universities and organizations have an address on the Internet, called a Web site or home page. The

address of the Web site for the publisher of this text is *www.course.com*. You can gain access to the Internet through a browser, such as Internet Explorer or Netscape. Using an Internet browser, go to the Web site for this publisher. What did you find? Try to obtain information on this book. You may be asked to develop a report or send an e-mail message to your instructor about what you found.

2. Go to an Internet search engine, such as *www.yahoo.com*, and search for information about a company, including its Web site. Write a report that summarizes the size of the company, the number of employees, its products, the location of its headquarters, and its profits (or losses) for last year. Would you want to work for this company?
3. Use the Internet to research a career in an IS area, such as programmer, systems analyst, Web developer, or CIO. Write a brief report describing the career area, including salaries and job opportunities. You may be asked to send an e-mail message to your instructor about what you found.

CAREER EXERCISES

1. In the Career Exercises found at the end of every chapter, you will explore how material in the chapter can help you excel in your college major or chosen career. Write a brief report on the career that appeals to you the most. Do the same for two other careers that interest you.
2. Pick the five best companies for your career. Describe how each company uses information systems to help achieve a competitive advantage.

VIDEO QUESTIONS

Watch the video clip **Go Inside Krispy Kreme** and answer these questions:

1. Provide a description of how Krispy Kreme is using each of the elements of an information system: hardware, software, databases, telecommunications, people, and procedures to provide services for its employees.
2. How have information systems assisted the many Krispy Kreme franchises in providing consistent products and services for their customers?

CASE STUDIES

Case One

The Queen Mary 2 and Partner

The Queen Mary 2 (QM2) is the largest and most expensive cruise ship ever built. It includes five swimming pools, a planetarium, a two-story theater that seats 1,000, a casino, a gym, luxurious kennels, a nursery staffed with British nannies, and the largest ballroom, library, and wine collection at sea. Of all its amenities, the one considered most valuable to the crew and management and key to the functioning of the vessel is the integrated network and information system accessible in every cabin.

The $800 million QM2, constructed in the shipyard at Chantiers de l'Atlantique, France, and owned by Miami-based Cunard Line Ltd., made her maiden voyage in early 2004. Passengers in each of her 1,310 cabins had access to digital entertainment such as on-demand movies and interactive television. Each cabin is also wired with Internet access and network services. For example, passengers use the network to make shore excursion reservations and dinner plans.

Upon checking in, passengers are presented with a plastic bar-coded card. The card is used while on board to make purchases, which are then billed to the customer's account. It is also swiped as guests leave and return to the ship to track passenger location. The ship's massive data network brings order where there once was chaos. Ship managers can run reports showing which passengers are on board, how many will be attending the morning exercise class, and which entrée was most popular at last night's dinner. The network

and database are backed up by redundant systems that automatically take over if the primary system fails.

The information system, called The Ship Partner, is used to track security, billing, telephone service, onboard television, and other operations. It was designed by Discovery Travel Systems LP (DTS). John Broughan, president of DTS, says that the IT needs of cruise ship operators differ from those of typical hotel property management companies, so specialized systems had to be created to better serve cruise companies.

The Queen Mary 2 provides yet another example of how information systems assist with management functions, providing valuable information and offering services to customers.

Discussion Questions

1. What conveniences does The Ship Partner information system provide to passengers of the Queen Mary 2? What entertainment services could be made available to passengers through this digital network?
2. How does The Ship Partner information system assist ship managers with their duties and responsibilities?

Critical Thinking Questions

3. How does The Ship Partner information system assist Cunard in competing in the travel industry? What other travel and leisure industries would benefit from a system like The Ship Partner?
4. Why is it important for The Ship Partner to have a backup system? How would a systemwide failure affect the functioning of the ship?

SOURCES: Todd R. Weiss, "New Queen Mary 2 Offers High Tech on the High Seas," *Computerworld*, January 12, 2004, *www.computerworld.com*; Eric Thomas, "Queen Mary 2, World's Biggest Liner, Awaits Its Champagne Moment," *Agence France Presse*, January 8, 2004; The Chantiers de l'Atlantique Web site, *www.chantiersatlantique.com/UK/index_UK.htm*, accessed January 18, 2004.

Case Two

MyFamily Comforts Its Members

MyFamily.com, Inc., is a leading online subscription business for researching family history, and the site also allows families to set up their own Web site and share photos with other family members.

MyFamily.com was one of the rare companies that survived the hardships of the dot-com bust. Through smart business management and providing a highly valued service to its customers, MyFamily.com actually grew its business when many others lost theirs. From 1999 through 2003, MyFamily.com doubled its subscribers each year, finishing 2003 with 1.6 million customers.

The rapid growth of the company presented MyFamily.com with challenges in customer relationship management (CRM). The company was hiring many customer service representatives just to respond to customer e-mail. Much of the e-mail involved simple questions that employees answered repeatedly day in and day out. What MyFamily.com needed was a system to help organize its customer support function and allow the company to make better use of its employees. The solution lay in a self-service CRM application from RightNow Technologies called eService Center.

The eService Center provides Web-based customer support for routine customer inquiries, freeing up customer service representatives to handle more difficult problems. It uses artificial intelligence contained in a single self-learning knowledge base that can be accessed from the Web, e-mail, chat room, or telephone. The system makes it easy for customers to find answers to questions by presenting the most successful solutions first and refining the solution based on customer responses. The eService Center also includes analytics and the ability to measure customer satisfaction through surveys.

Within 30 days after MyFamily.com implemented RightNow's system, the number of e-mails that employees had to answer fell 30 percent, according to Mary Kay Evans, spokeswoman for MyFamily.com. Calculating the savings in employee time, MyFamily.com has received over two and a half times as much as it invested in the system over nine months—a 260 percent return on investment (ROI). The new system earned MyFamily.com two awards in 2003: SearchCRM honored MyFamily.com with the Customer Touch award, and *CRM Magazine* awarded MyFamily its 2003 CRM Elite award.

Discussion Questions

1. What type of information system is RightNow's eService Center, a TPS, MIS, DSS, or some other specialized system? Present the rationale for your answer.
2. Besides cost savings, what other benefits does the eService Center provide for the upper-level managers of MyFamily.com?

Critical Thinking Questions

3. Have you had any experience with automated customer service systems? Do you think that these services benefit the company or the customer more? Why?
4. The types of questions that this automated system assists customers with are described as typical customer inquiries. Do you think handling frequently asked questions (FAQs) is a job better suited for man or machine? Why?

SOURCES: Linda Rosencrance, "CRM with a Family Touch," *Computerworld*, April 7, 2003, *www.computerworld.com*; "RightNow Customer MyFamily.com Wins SearchCRM.com's Customer Touch Award for Effective Service & Support," *PR Newswire*, September 11, 2003; MyFamily.com Web site, *www.myfamily.com*, accessed January 17, 2004.

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