CHAPTER 1

Managing in the Digital World

After reading this chapter, you will be able to do the following:

1. Explain what an information system is, contrasting its data, technology, people, and organizational components.
2. Describe types of jobs and career opportunities in information systems and in related fields.
3. Describe the dual nature of information systems in the success and failure of modern organizations.

Preview

Today, organizations from Apple Computer to Zales Jewelers use computer-based information systems to better manage their organizations in the digital world. These organizations use information systems to provide high-quality goods and services as well as to gain or sustain competitive advantage over rivals. Our objective for Chapter 1 is to help you understand what information systems are, how they have evolved to become a vital part of modern organizations, and why this understanding is necessary for you to become an effective manager in the digital world.

The next section provides a brief overview of the book. Then, we explain what information systems are and how they have evolved. We conclude by illustrating how information systems can be utilized to improve organizational performance.

Managing in the Digital World: Apple Computer

It happened on April Fools' Day, 1976, but history has shown it was no joke. On that date, Stephen "Woz" Wozniak and Steven Paul Jobs officially formed the Apple Computer Company. The two friends had been fascinated with computers since their days as students at Homestead High School in Cupertino, California. Wozniak graduated first, in 1967, because he is five years older than Jobs, but their shared interest in anything digital kept bringing the two together, both before Jobs graduated from high school and after he graduated in 1972.

The two Steves both dropped out of college to work on building computers—first in Jobs' bedroom, then in his garage when the bedroom got too crowded. (Wozniak later returned to school at the University of California in Berkeley and graduated with a degree in engineering in 1986.) At first they were interested just in building circuit boards but later decided to build entire computers and sell them to home users. The Apple I debuted shortly after the company was formed and sold for $666.66.

Before the Apple I came the Altair 8800—the first home computer. Buyers had to assemble the machine themselves, there was no monitor, and switches had to be tripped manually and in proper sequence for the machine to function at all. The machine was a fun tool for geeks but not practical for the average computer user (in fact, there were no "average computer users" as we know them today).

However, the introduction of the Apple I computer paved the way for profound changes in the way everyday people would use computers. Shortly after the introduction of the Apple I, Wozniak and Jobs developed the Apple II, which included a keyboard, a floppy disk drive, and color graphics. Because of its jazzy appearance and ease of use (which can't be compared with today's personal computers), consumers liked the Apple II, and the Apple Company eventually sold 50,000 units. It continued to be Apple's dominant product until 1993. To date, the Apple II's seventeen-year life span is a record within the computer industry.

Wozniak and Jobs' working relationship was key to Apple's success. Wozniak, the engineer, was concerned primarily with a computer's function, while Jobs focused on ease of use and design. Thanks to the two-Steves team, the Apple II was an attractive and functional addition to a family's living room. Apple continues to offer products that are a blend of engineering and aesthetics, and many consumers are devoted to the products. The history of Apple Computers, however, includes a series of high highs and low lows. For example, the Lisa, introduced in 1983, was a commercial disaster, and the Apple III, introduced shortly after the Apple II, was discontinued after only a year on the market when it failed to entice consumers. In 1984, Apple once again had a hit when it introduced the popular Macintosh 128K, featuring the AppleMouse II (the first computer mouse introduced to the mass market) and the first true graphical user interface. When Apple introduced the Macintosh Portable (an early laptop), it had only limited success, but after is was redesigned and renamed, the PowerBook proved a marketplace success. Other near failures for Apple included the Apple Newton (an early PDA) and the G3 enterprise server computer (for more on Apple's failures, see *When Things Go Wrong* later in the chapter).

Jobs left Apple in 1985 amid employee complaints that he was an erratic and tempestuous manager; Wozniak left Apple for good in 1986. Jobs was so disgruntled when he left Apple that he sold all but one share of his stock in the company. Jobs then started another computer company, NeXT Computer, which designed and marketed a technologically advanced computer that did not sell well because of its high price. Apple's leadership foundered for a while,

FIGURE 1.1

Apple has been an innovative leader in the computer and consumer electronics industries.

but the company purchased NeXT for $402 million in 1996, and Jobs again took over the helm. Jobs brought Apple back to profitability by revamping its product line. The iMac, a PowerBook featuring a fourteen-inch display, and Mac OS X—a new operating system—were the most successful units in the 1998 product line.

Jobs has remained Apple's chief executive officer (CEO), seeing the company through additional product successes with the introduction of the iPod, the iPhone, and the MacBook Air.

The iPod is the universally familiar hard drive–based MP3 music player, which debuted in November 2001 (selling for $250, and offering 4 GB of storage for music files) and went mainstream in 2003. The simple user interface and small size made the iPod one of the most sought after digital music players. What is so attractive to consumers is the fact that the iPod is offered with several customizable features, such as connectability to a car's stereo system or to external speakers, a camera, and choices of outer skin color. Apple soon improved on the original iPod design, offering the iPod mini, iPod color, iPod shuffle, iPod nano, and so on. Although competitors have released their own digital music players, none have achieved Apple's market share.

To add to the iPod's success, Apple created an online music store called iTunes, where users could download digital music for 99 cents per track. The combination of product (the iPod) and service (online iTunes store) resulted in massive profits for Apple. Although initially the music from the online store could only be downloaded using an Apple computer, later the downloads could be made from any machine (though they still can only be played on iPods). Recently, iTunes has expanded into the video market, providing videos—television shows as well as new releases of Hollywood blockbusters—for video-capable iPods.

The most recent addition to the iTunes Store is iTunes U, a selection of educational material from various universities. Apple says iTunes U puts "the power of the iTunes Store to work for colleges and universities, so users can easily search, download, and play course content just like they do music, movies, and TV shows." Apple continued its success with new products in 2007 when it introduced the iPhone—a smart phone with Internet access and a touch-screen interface (see Figure 1.1)—and again in 2008 with the MacBook Air. The iPhone sold 1.4 million units the first ninety days after its introduction and has continued to outsell other smart phones on the market.

Barely as thick as your index finger and weighing a mere three pounds, the MacBook Air, introduced in 2008, also proved popular with consumers. The lightweight laptop boasted 2 GB of built-in RAM, an 80 GB hard drive, and a 1.6 to 1.8 GHz Intel Core 2 dual processor.

While Apple Computers has a long list of successful products, in 2005, environmentalists criticized the company for its lack of an e-waste recycling policy. Jobs was at first defiant, dismissing such complaints as trivial, but shortly after Apple's annual meeting in April 2005, he announced that Apple would take back used iPods for free. In 2006, he further expanded Apple's recycling programs to any customer who buys a new Mac. This program includes shipping and "environmentally friendly disposal" of customers' old systems. In late 2007, Apple once again came under scrutiny from Greenpeace, this time for the use of toxic chemicals in the iPhone. Only a few days later, Apple announced that in addition to recycling its old products, toxic chemicals would be removed from new products.

Thanks to innovative product design, clever marketing tactics, and swift response to environmental concerns, Apple Computers' profits have consistently risen over the past several years, and financial analysts see more of the same in the company's future.

After reading this chapter, you will be able to answer the following:

1. Given the pace at which technology is converging (e.g., phones, music players, cameras, and so on), what do you think is next for Apple?
2. Apple has had many "near death" experiences throughout its history. Is Apple now here to stay?
3. Jobs has been the catalyst for many of Apple's successes (and failures). Can Apple survive without Jobs?

Based on:

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What You Will Find in This Book

This book provides a comprehensive presentation of the information systems body of knowledge and is organized as follows:

- ***Chapter 1—Managing in the Digital World.*** Here we provide an overview of what information systems are and how they are being used in modern organizations.
- ***Chapter 2—Fueling Globalization Through Information Systems.*** Here we provide an overview of how the pervasive use of information systems is fueling globalization and rapid change in the world.
- ***Chapter 3—Valuing Information Systems Investments.*** Here we examine how information systems can be utilized to improve organizational performance as well as provide a return on investment.
- ***Chapter 4—Managing the Information Systems Infrastructure.*** Here we provide an overview of the various components of a comprehensive infrastructure and how organizations are managing this infrastructure to best utilize their information systems investments.
- ***Chapter 5—Enabling Commerce Using the Internet.*** Here we focus on how organizations are utilizing the Internet to create business opportunities and sustain competitive advantage.
- ***Chapter 6—Enhancing Collaboration Using Web 2.0.*** Here we examine various emerging Web technologies that are expanding the capabilities of individuals and organizations.
- ***Chapter 7—Securing Information Systems.*** Here we examine how organizations can best secure their information systems.
- ***Chapter 8—Enhancing Business Intelligence Using Information Systems.*** Here we describe various kinds of information systems that firms use to improve business decision making.
- ***Chapter 9—Building Organizational Partnerships Using Enterprise Information Systems.*** Here we examine how information systems can be used to help integrate the entire organization and help connect the firm to customers, suppliers, and partners.
- ***Chapter 10—Developing and Acquiring Information Systems.*** Here we describe how information systems and services are developed and/or acquired.
- ***Chapter 11—Managing Information Systems Ethics and Crime.*** Here we discuss key legal and ethical issues for successfully managing information systems.

In addition to these chapters, an optional technology briefing provides a foundation for better understanding how these various technologies function and can be configured to create the power of modern information systems.

Our primary objective when designing this book was to focus on the big picture, trying not to bog you down with unnecessary technological jargon. Nevertheless, to effectively manage in the digital world, you need a comprehensive understanding of what information systems are, the necessary vocabulary to understand and explain these technologies, what factors are shaping the digital world, the categories and types of information systems, and how organizations are deploying these systems to create value and competitive advantage. We hope that you agree after reading the book that we have achieved this objective.

Information Systems Today

In 1959, Peter Drucker predicted this rise in the importance of information and of information technology, and at that point, over four decades ago, he coined the term **knowledge worker**. Knowledge workers are typically professionals who are relatively well educated and who create, modify, and/or synthesize knowledge as a fundamental part of their jobs.

Drucker's predictions about knowledge workers were very accurate. As he predicted, they are generally paid better than their prior agricultural and industrial counterparts; they rely on and are empowered by formal education, yet they often also possess

valuable real-world skills; they are continually learning how to do their jobs better; they have much better career opportunities and far more bargaining power than workers ever had before; they make up about a quarter of the workforce in the United States and in other developed nations; and their numbers are rising quickly.

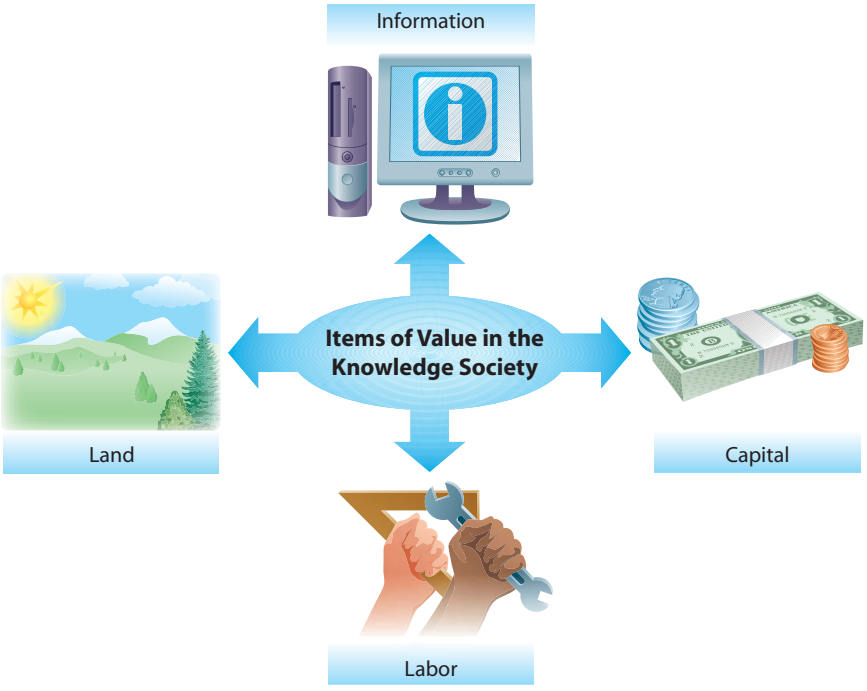
Drucker also predicted that, with the growth in the number of knowledge workers and with their rise in importance and leadership, a **knowledge society** would emerge. He reasoned that, given the importance of education and learning to knowledge workers and the firms that need them, education would become the cornerstone of the knowledge society. Possessing knowledge, he argued, would be as important as possessing land, labor, or capital (if not more so) (see Figure 1.2). Indeed, research shows that people equipped to prosper in the knowledge society, such as those with a college education, earn far more on average than people without a college education, and that gap is increasing. In fact, information from the U.S. Census Bureau (2007 data) reinforces the value of a college education: workers eighteen and over with a bachelor's degree earn an average of $56,788 a year, while those with a high school diploma earn $31,071. Workers with an advanced degree make an average of $82,320, and those without a high school diploma average $20,873. Additionally, getting a college degree will qualify you for many jobs that would not be available to you otherwise and will distinguish you from other job candidates. Finally, a college degree is often a requirement to qualify for career advancement and promotion opportunities once you do get that job.

People generally agree that Drucker was accurate about knowledge workers and the evolution of society. While people have settled on Drucker's term "knowledge worker," there are many alternatives to the term "knowledge society." For example, Manuel Castell has written that we now live in a network society. *Wired* magazine has published that we now live in a **new economy** and described it as follows:

> So what is the new economy? When we talk about the new economy, we're talking about a world in which people work with their brains instead of their hands. A world in which communications technology creates global competition—not just for running shoes and laptop computers, but also for bank loans and other services that can't be packed into a crate and shipped. A world in which innovation is more important than mass production. A world in which investment buys new concepts or the means to create them, rather than new machines. A world in which rapid change is a

FIGURE 1.2

In the knowledge society, information has become as important as—and many feel *more important than*—land, labor, and capital resources.



constant. A world at least as different from what came before it as the industrial age was from its agricultural predecessor. A world so different its emergence can only be described as a revolution (Browning and Reiss, 1998).

Others have referred to this phenomenon as the knowledge economy, the digital society, the network era, the Internet era, and other names. We simply refer to this as the *digital world.* All of these ideas have in common the premise that information and related technologies and systems have become very important to us and that knowledge workers are vital.

Some have argued, however, that there is a downside to being a knowledge worker and to living in the digital world. For example, Kit Sims-Taylor has argued that knowledge workers will be the first to be replaced by automation with information technology. Jeremy Rifkin has argued that our overreliance on information technology has caused us to think and act hastily and to lose our perspective. Others have argued that in the new economy there is a *digital divide,* where those with access to information technology have great advantages over those without access to information technology (for more, see Chapter 11).

To be sure, there is a downside to overreliance on knowledge workers and information technology, but one thing is for certain: knowledge workers and information technologies are now critical to the success of modern organizations, economies, and societies. What are some of the characteristics of the digital world? This is examined next.

Characteristics of the Digital World

Computers are the core component of information systems. Over the past decade, the advent of powerful, relatively inexpensive, easy-to-use computers has had a major impact on business. To see this impact, look around your school or place of work. At your school, you may register for classes online, use e-mail to communicate with fellow students and your instructors, and complete or submit assignments on networked personal computers. At work, you may use a personal computer for e-mail and other tasks. Your paychecks are probably generated by computer and automatically deposited in your checking account via high-speed networks. Chances are that each year you see more information technology than you did the year before, and this technology is a more fundamental and important part of your learning and work than ever before.

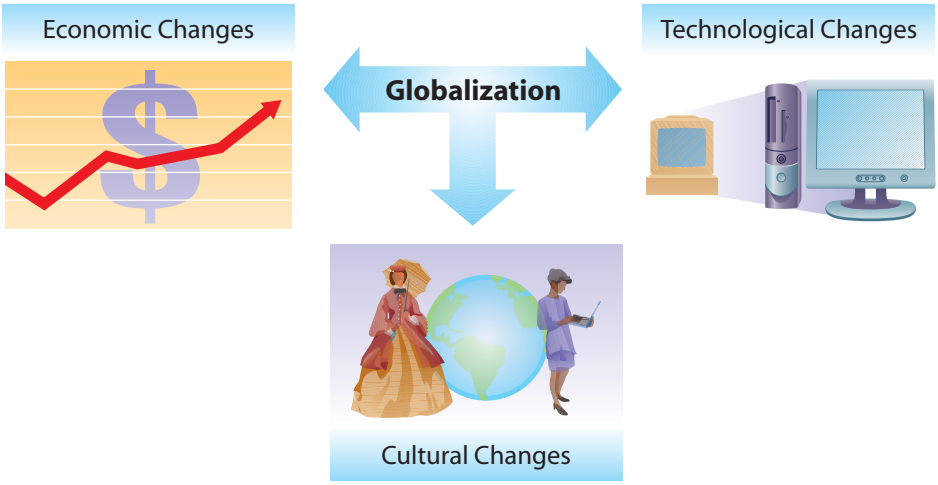
When you stop and think about it, it is easy to see why information technology is important. Increasing global competitiveness has forced companies to find ways to be better and to do things less expensively. The answer for many firms continues to be to use information systems to do things better, faster, and cheaper. Using global telecommunications networks, companies can more easily integrate their operations to access new markets for their products and services as well as access a large pool of talented labor in countries with lower wages.

This integration of economies throughout the world, enabled by technological progress, is called *globalization* (see Chapter 2). You can see the effects of globalization in many ways, such as the greater international movement of commodities, money, information, and labor, as well as the development of technologies, standards, and processes to facilitate this movement (see Figure 1.3). Specifically, a more global and competitive world includes visible economic, cultural, and technological changes, including the following:

- ***Economic Changes.*** Increases in international trade, in the development of global financial systems and currency, and in the outsourcing of labor.
- ***Cultural Changes.*** Increases in the availability of multiculturalism through television and movies; the frequency of international travel, tourism, and immigration; the availability of ethnic foods and restaurants; and the frequency of worldwide fads and phenomena such as Pokémon, Sudoku, *Idol* television, and MySpace.
- ***Technological Changes.*** The development of low-cost computing platforms and communication technologies; the availability of low-cost communication systems such as e-mail, Skype, and instant messaging; the ubiquitous nature of a low-cost global telecommunications infrastructure like the Internet; and the enforcement of global patent and copyright laws to spur further innovation.

FIGURE 1.3

Globalization can be seen in visible economic, cultural, and technological changes.



Through the convergence of economics and culture, fueled by a robust global technology infrastructure, the world has forever changed. Given their central role in this ongoing global revolution, information systems are defined next.

Information Systems Defined

Information systems (IS) are combinations of **hardware**, **software**, and **telecommunications networks** that *people* build and use to collect, create, and distribute useful *data*, typically in organizational settings. Hardware refers to physical computer equipment, such as the computer monitor, central processing unit, or keyboard. Software refers to a program or set of programs that tell the computer to perform certain tasks. Telecommunications networks refer to a group of two or more computer systems linked together with communications equipment. Although we discuss the design, implementation, use, and implications of hardware, software, and telecommunications throughout the chapters, the specifics on hardware, software, and telecommunications are discussed in detail in Chapter 4 and the Technology Briefing. In Figure 1.5, we show the relationships among these IS components.

People in organizations use information systems to process sales transactions, manage loan applications, or help financial analysts decide where, when, and how to invest. Product managers also use them to help decide where, when, and how to market their products and related services, and production managers use them to help decide when and how to manufacture products. Information systems also enable us to get cash from ATMs, communicate by live video with people in other parts of the world, and buy concert or airline tickets. (Note that the term "information systems" is also used to describe the field comprising people who develop, use, manage, and study information systems in organizations.)

It is important to note that people use various terms to describe the field of information systems, such as management information systems, data processing management, systems management, business computer systems, computer information systems, and simply "systems." Since the term "information systems" is most common, we will stick with this term and its acronym, IS. Next, we more thoroughly examine each of the key components of the information systems definition.

Data: The Root and Purpose of Information Systems

Earlier, we defined IS as combinations of hardware, software, and telecommunications networks that people build and use to collect, create, and distribute useful data, typically in organizational settings. We will begin by talking about data, the most basic element of any information system.

Data Before you can understand how information systems work, it is important to distinguish between data and information, terms that are often erroneously used interchangeably. **Data** is raw material—recorded, unformatted information, such as words and numbers.

Failure: The Path to Success?

Management consultant Tom Peters, author or coauthor of ten international best-sellers, including *In Search of Excellence, Thriving on Chaos*, *The Pursuit of Wow!*, and his latest, *Re-Imagine! Business Excellence in a Disruptive Age,* often tells business managers that a company's survival may depend upon those employees who fail over and over again as they try new ideas. There's little that is more important to tomorrow's managers than failure, Peters maintains.

Apparently Apple Computers lives by Peters' philosophy. In January 2008, to help celebrate twenty-five years of the Mac, first introduced to consumers in 1984, *Wired* magazine recalled some of Apple's more infamous failures.

One of Apple's most visible flops was the Newton, actually the name of a newly conceived operating system that stuck to the product as a whole. The Newton, which Apple promised would "reinvent personal computing," fell far short of its hype when it was introduced in 1993 as a not-so-revolutionary PDA. The Newton was on the market for six years—a relatively long time for an unsuccessful product—but one of Steve Jobs' first acts when he returned to Apple's helm in 1997 was to cut the Newton Systems Group.

Other Apple product failures include:

- The Pippin, introduced in 1993, an inexpensive game player/network computer that couldn't compete with Nintendo's 64 or the Sony PlayStation.
- The TAM (Twentieth Anniversary Macintosh), which debuted in 1997 and lasted only a year. The sleek design was contemporary and attractive, but the machine was panned as overpriced and underpowered.
- The Macintosh television, of which only ten thousand units were produced, from 1993 to 1994. It tanked because it was incapable of showing television feeds in a desktop window.
- The PowerMac G4 Cube, an 8" × 8" × 8" designer machine that needed a separate monitor (as opposed to the popular iMac series) and was never popular with consumers.
- The Apple IIc (the "c" is for compact), which was meant to be the world's first portable computer and came complete with carrying case. It lacked internal expansion slots and direct access to the motherboard, however, and thus was less popular than other Apple II models that allowed users to upgrade.
- The puck mouse that came with the iMac G3. Apple made the mouse popular, but miscued when it expected consumers to adapt to this too-small, awkward-to-control device that users often mistakenly used upside down. The puck was soon replaced with the Mighty Mouse—a consumer favorite.
- The Lisa, introduced in 1983, was intended for business use, but its whopping $9,995 price tag (more than $20,000 in current dollars) made it too rich for most businesses, which could buy PCs at much lower prices. The Lisa was retired in 1986, after the Mac had captured consumers' attention.

FIGURE 1.4

The Apple Newton was not a commercial success.

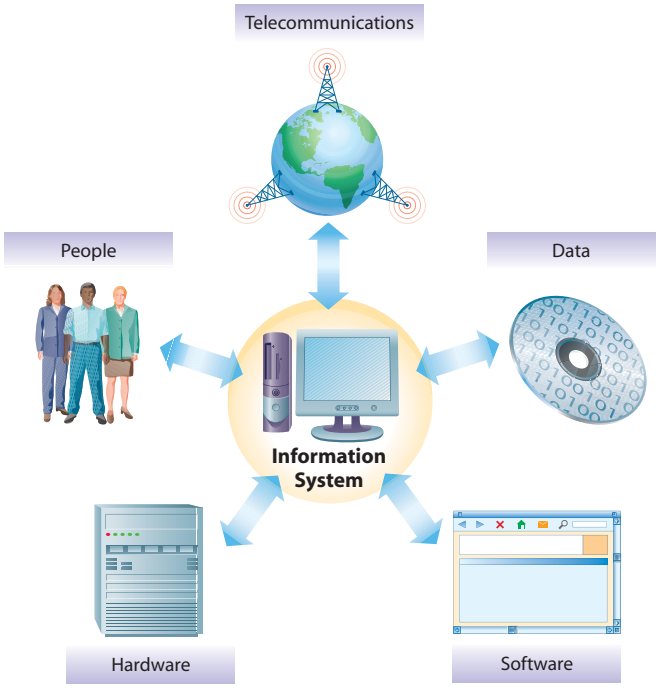
Apple's failures are often cited by its competitors, but the company has proved Peters right time and time again: Any company without an interesting list of failures probably isn't trying hard enough.

Based on:

Gardiner, B. (2008, January 24). Learning from failure: Apple's most notorious flops. *Wired*. Retrieved May 17, 2008, from http://www.wired.com/gadgets/mac/multimedia/2008/01/gallery_apple_flops.

FIGURE 1.5

An information system is a combination of five key elements: people, hardware, software, data, and telecommunications networks.



Data has no meaning in and of itself. For example, if we asked you what 465889727 meant or stood for, you could not tell us (see Figure 1.6). However, if we presented the same data as 465-88-9727 and told you it was located in a certain database, in John Doe's file, in a field labeled "SSN," you might rightly surmise that the number was actually the Social Security number of someone named John Doe.

Information Data formatted with dashes or labels is more useful than unformatted data. By adding context, it is transformed into **information**, which can be defined as a representation of reality. In the previous example, 465-88-9727 was used to represent and identify an individual person, John Doe (see Figure 1.6). Contextual cues, such as a label, are needed to turn data into information that is familiar to the reader. Think about your experience with ATMs. A list of all the transactions at a bank's ATMs over the course of a month would be fairly useless data. However, a table that divided ATM users into two categories, bank customers and non–bank customers, and compared the two groups' use of the machine—their purpose for using the ATMs and the times and days on which they use them—would be incredibly useful information. A bank manager could use this information to create marketing mailings to attract new customers. Without information systems, it would be difficult to make data useful by turning it into information.

FIGURE 1.6

Data, information, knowledge, and wisdom.

Data	Information	Knowledge	Wisdom
465889727	465-88-9727	465-88-9727 → John Doe	465-88-9727 → John Doe → School Records, Employment Records, Medical Records
Unformatted Data	Formatted Data	Data Relationships	Data Relationships for Multiple Domains
Meaning: ---------- ???	Meaning: ---------- SSN	Meaning: ---------- SSN → Unique Person	Meaning: ---------- SSN → Uniqe Person → Any Information About the person

Knowledge In addition to data and information, knowledge and wisdom are also important. **Knowledge** is needed to understand relationships between different pieces of information. For example, you must have knowledge to be aware that only one Social Security number can uniquely identify each individual (see Figure 1.6). Knowledge is a body of governing procedures, such as guidelines or rules, that are used to organize or manipulate data to make it suitable for a given task.

Wisdom Finally, **wisdom** is accumulated knowledge. Wisdom goes beyond knowledge in that it represents broader, more generalized rules and schemas for understanding a specific domain or domains. Wisdom allows you to understand how to apply concepts from one domain to new situations or problems. Understanding that a unique individual identifier, such as a Social Security number, can be applied in certain programming situations to single out an individual record in a database is the result of accumulated knowledge (see Figure 1.6). Wisdom can be gained through a combination of academic study and personal experience.

Understanding the distinctions between data, information, knowledge, and wisdom is important because all are used in the study, development, and use of information systems.

Information Technology: The Components of Information Systems

When we use the term "information system," we are talking about **computer-based information systems**. Computer-based information systems are a type of technology. Here we briefly distinguish between technology, information technology (IT), and information systems.

Technology Versus Information Technology **Technology** is any mechanical and/or electrical means to supplement, extend, or replace human, manual operations, or devices. Sample technologies include the heating and cooling system for a building, the braking system for an automobile, and a laser used for surgery. In Figure 1.7, we show the relationship between technologies and computer-based information systems.

The term **information technology (IT)** refers to machine technology that is controlled by or uses information. One type of information technology is a programmable robot on the shop floor of a manufacturing firm that receives component specifications and operational instructions from a computer-based database. Throughout this book, when we speak of technology, we are typically referring to IT unless noted.

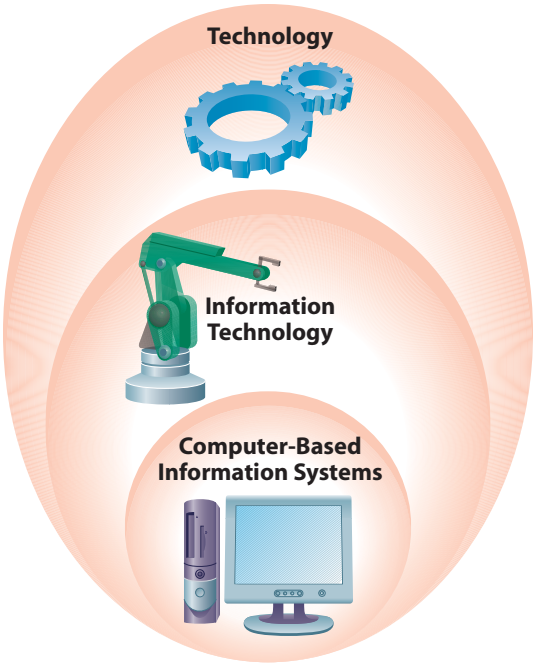
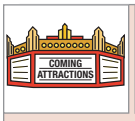


FIGURE 1.7

Computer-based information systems are a subset of information technologies and of technologies in general.

We could argue that any technology makes use of information in some fundamental way, as does each of the three examples of basic technology listed earlier (heating system, braking system, and a laser). However, information technologies, such as programmable manufacturing robots, use more information and in a more sophisticated way. It may appear that we are splitting hairs by distinguishing among technologies and information technologies. While the distinction is subtle, it is important. Information technologies use machine technologies as building blocks and then combine them with computing and networking technologies. A technology such as a mechanical drill press is useful, but it is more useful when combined with a computer database that instructs that drill press when and how to act.

Information Technology Versus Information Systems Information technologies and information systems are similar but also different. Remember that we defined an information system as a combination of hardware, software, and telecommunications networks that people build and use to collect, create, and distribute data. The goal of an information system is to provide useful data to people. An example of an information system is the use of specialized software on a computer-controlled, mechanical machine



Coming Attractions

How to Build a Bionic Contact Lens

Harbingers of the future see individuals wearing computers, rather than sitting in front of them. Maybe your clothing is wired to send and receive messages, your eyeglasses can connect to the Internet from any location, or a bionic contact lens for your eye constantly monitors body systems and alerts you to disease or other harmful physiological conditions. Is it possible? Scientists say "absolutely" and, in an attempt to extend "personal computer" to its ultimate definition, are at work on all of these concepts.

Bionic eyes for implant into the eyes of blind or partially blind individuals are currently in development, but a less intrusive bionic contact lens that a sighted individual would wear is also in the works at the University of Washington in Seattle. There, computer scientists and engineers are working on implanting electronics into polymers that can ultimately be worn like contact lenses. The purpose of the electronic lens research is twofold: (1) to determine if it is possible to create a contact lens that superimposes a display over the wearer's field of vision, without interfering with real-world vision; and (2) to build the lenses for practical applications, such as displaying text messages from cell phones, monitoring body chemistry, or even sensing environmental changes for soldiers in the field.

Construction problems must be solved, however, before any practical applications are feasible. For instance:

- Plastics used as a substrate for the electronics must be biocompatible.
- Electronic components containing light-emitting diodes (LEDs) must be small enough to fit over the eye without causing discomfort and yet must be functional.
- The high heat necessary to bond electronics to plastics can melt the plastic, so an extra step is needed to place the electronics on the plastic lens.
- Where will the power come from to run the electronics? (Scientists designing the lens are exploring coils that harvest radio frequency energy.)

Furthermore, the bionic lens has yet to be tested on the human eye. To date, the lens was tested on a rabbit's eye for twenty minutes with no ill effects, but the LEDs were not turned on. Scientists have yet to determine that the device is safe and operational when LEDs are working.

Clearly, the concept of wearable computers is no longer a science fiction dream, but is becoming reality.

Based on:

Greene, K. (2008, January 25). How to build a bionic eye: Researchers have created an electronic contact lens that could be used as a display or a medical sensor. *Technology Review.* Retrieved May 17, 2008, from http://www.technologyreview.com/Infotech/20113.

Penland, J. (2008, February 22). Bionic contact lenses. *Sciencentral News.* Retrieved May 17, 2008, from http://www.sciencentral.com/articles/view.php3?type=article&article_id=218393067.

used to produce compact discs (CDs), combined with other shop-floor equipment that allows a person to monitor and control the production of each CD from a separate, possibly remote, computer.

Other examples of information systems include a series of integrated electronic spreadsheets used for creating a budget, an order-fulfillment system for managing customers' purchases, and a set of linked pages on the Web to display company and product information. You may be asking, "Does my PC at work or school count as part of the company's or university's overall information system?" Our answer is yes. Information systems include personal, group, organizational, interorganizational, and even global computing systems.

People: The Builders and Managers of Information Systems

The information systems field includes a vast collection of people who develop, maintain, manage, and study information systems. The career opportunities for a person with IS training continue to be strong, and they are expected to continue to improve over the next ten years. For example, in 2008, the U.S. Bureau of Labor Statistics predicted that employment for computer and information systems managers will grow faster than the average for all occupations through 2016. This boost in employment will occur in nearly every industry, not just computer hardware and software companies, as more and more organizations rely more heavily on IS professionals. Likewise, *Money* magazine (http://money.cnn.com/magazines/moneymag/bestjobs) ranked "Computer/IT Analyst" as one of its top ten best jobs for the next decade (see Table 1.1); also, *FastCompany Magazine* (http://www.fastcompany.com/articles/2006/01/top-jobs-main.html) rated "Computer and Information Systems Managers" as its fifth-best job over the coming decade. Finally, in 2008, *US News & World Report* selected being a systems analyst as one of its thirty-one best careers.

In addition to an ample supply of jobs, earnings for information systems professionals will remain strong. According to the U.S. Bureau of Labor Statistics, median annual earnings of these managers in May 2006 were $101,580. The middle 50 percent earned between $79,240 and $129,250. Also, according to Salary.com, average salaries in 2008 for high-level information technology managers ranged from $89,864 to $119,900. According to a 2007 survey by the National Association of Colleges and Employers, starting salary offers for information systems majors, with one year or less of experience, averaged $49,966. Finally, computer and information systems managers, especially those at higher levels, often receive more employment-related benefits—such as expense accounts, stock option plans, and bonuses—than do nonmanagerial workers in their organizations.

Even with lower-level, highly technical jobs, such as systems programmers, being *outsourced* to organizations in other countries (in order to reduce labor costs; outsourcing will be discussed later in this chapter), there continues to be a very strong need for people with information systems knowledge, skills, and abilities—in particular, people with advanced information systems capabilities, as we will describe here. In fact, information systems careers are regularly selected as not only one of the fastest growing, but a career with far above average opportunities for greater personal growth, stability, and advancement.

TABLE 1.1 Best Jobs for the Next Decade

Rank	Career	Job Growth (10-year forecast)	Average Pay (salary and bonus)
1	Software engineer	46.07%	$80,427
2	College professor	31.39%	$81,491
3	Financial adviser	25.92%	$122,462
4	Human resources manager	23.47%	$73,731
5	Physician assistant	49.65%	$75,117
6	Market research analyst	20.19%	$82,317
7	**Computer/IT analyst**	**36.10%**	**$83,427**
8	Real estate appraiser	22.78%	$66,216
9	Pharmacist	24.57%	$91,998
10	Psychologist	19.14%	$66,359

Based on: http://money.cnn.com/magazines/moneymag/bestjobs.

Careers in IS The field of IS includes those people in organizations who design and build systems, those who use these systems, and those responsible for managing these systems. In Table 1.2, we list careers in IS and the salaries you might earn in those positions. The people who help develop and manage systems in organizations include systems analysts, systems programmers, systems operators, network administrators, database administrators, systems designers, systems managers, and chief information officers.

Another significant part of the IS field is the group of people who work in IS consulting firms, such as IBM, EDS, and Accenture. Experts in these consulting firms advise organizations on how to build and manage their systems and sometimes actually build and run those systems. Companies that have traditionally been hardware/software companies (such as IBM) are now doing a lot of systems consulting and related work. Similarly, companies such as Accenture that specialize in systems consulting are very successful—hiring more people, opening new offices, taking on new business, and generating lots of revenue.

University professors are another group of people in IS. These professors conduct research on the development, use, and management of information systems. Nonacademic researchers who conduct research for agencies such as the Department of Defense or for large corporations such as IBM, Xerox, Hewlett-Packard, and AT&T face almost unlimited opportunities. These professionals generally conduct more applied research and development than academic researchers. For example, a researcher for a major computer manufacturer might be developing a new computer product or examining ways to extend the life of a current product by integrating leading-edge components with the older architecture.

The Advent of the Chief Information Officer A number of important indications show that organizations are trying hard to manage information systems better. But perhaps nothing better demonstrates the growing importance of information systems in organizations than the advent of the **chief information officer (CIO)** and related positions in contemporary organizations.

EVOLUTION OF THE CIO. In the early 1980s, the CIO position became popular as the new title given to executive-level individuals who were responsible for the information systems component within their organizations. The CIO was charged with integrating new technologies into the organization's business strategy. Traditionally, the responsibility for integrating technology and strategy had not officially rested with any one manager. Responsibility for managing the day-to-day information systems function had previously rested with a mid-level operations manager or, in some cases, with a vice president of information systems. Ultimate responsibility for these activities would now rest with a high-level executive, the CIO. People began to realize that the information systems department was not simply a cost center—a necessary evil that simply consumed resources. They realized that information systems could be of tremendous strategic value to the organiza-

TABLE 1.2 Careers and Salaries in the Information Systems Field (National Average)

IS Activities	Typical Careers	Salary Ranges in Percentiles (25%–75%)
Develop	Systems analyst	$50,000–$85,000
	Systems programmer	$50,000–$80,000
	Systems consultant	$80,000–$120,000
Maintain	Information systems auditor	$45,000–$75,000
	Database administrator	$75,000–$100,000
	Webmaster	$55,000–$80,000
Manage	IS manager	$60,000–$90,000
	IS director	$85,000–$120,000
	Chief information officer (CIO)	$150,000–$250,000
Study	University professor	$70,000–$180,000
	Government scientist	$60,000–$200,000

Based on: http://www.salary.com; http://cnnmoney.com.

tion. As a result, this new IS executive would work much like other executives, sitting at the strategy table, working right alongside the chief executive officer, chief financial officer, chief operating officer, and other chief executives and key people in the organization. When strategic decisions were to be made, technology would play a major role, and the CIO needed to participate in the strategic decision-making process.

Not surprisingly, many organizations jumped on the CIO bandwagon and either hired or named a CIO. As a result, many people thought that the CIO boom was a fad that would soon end, as do many other popular management trends. In fact, in early 1990, *BusinessWeek* printed a story titled "CIO Is Starting to Stand for 'Career Is Over': Once Deemed Indispensable, the Chief Information Officer Has Become an Endangered Species" (Rothfeder and Driscoll, 1990). In this story, the authors reported statistics showing that in 1989 the CIO dismissal rate had doubled to 13 percent, which was noticeably higher than the 9 percent for all top executives. They explained that the primary reasons for CIO dismissals included tightening budgets for technology and management's overblown expectations of CIO functions. Apparently, many organizations had been caught up in the rush to have a CIO without thinking enough about why they needed a CIO in the first place. The authors countered, however, that given the growing trend toward using information systems to achieve a competitive advantage, the CIO could become relevant and important again. How right they were.

THE CIO TODAY. Today, most large organizations have a CIO or an equivalent position. It is also now common for midsized and smaller organizations to have a CIO-like position within their organizations, although they may give this person a title such as director of information systems. In 2007, *InformationWeek* named Tim Stanley of Harrah's Entertainment its CIO of the year. Harrah's, the largest casino gaming company in the world, is the envy of its industry due to its ability to anticipate and exceed customer needs and wants. Over the past year, for example, Stanley has led efforts to consolidate and leverage a massive customer data warehouse to better predict and react to customer needs. Additionally, he has led efforts to deploy wireless technologies such as RFID (see Chapter 9) to track customer movement and the rate at which chips are played as well as deploying new virtual games that can be accessed throughout Harrah's properties. Being a business innovation leader is an ongoing process for most CIOs. We will talk much more about gaining, and sustaining, competitive advantage using information systems in Chapter 3.

IS MANAGERIAL PERSONNEL. In large organizations, there typically are many other different management positions in addition to the CIO position within the IS function. In Table 1.3, we describe several such positions. This list is not exhaustive; rather, it is intended to provide a sampling of IS management positions. Furthermore, many firms will use the same job title, but each is likely to define it in a different way, or companies will have different titles for the same basic function. As you can see from Table 1.3, the range of career opportunities for IS managers is very broad.

What Makes IS Personnel So Valuable?

In addition to the growing importance of people in the IS field, there have been changes in the nature of this type of work. No longer are IS departments in organizations filled only with nerdy men with pocket protectors (Figure 1.8). Many more women are in IS positions now. Also, it is now more common for an IS professional to be a polished, professional systems analyst who can talk fluently about both business and technology. IS personnel are now well-trained, highly skilled, valuable professionals who garner high wages and prestige and who play a pivotal role in helping firms be successful.

Many studies have been aimed at helping us understand what knowledge and skills are necessary for a person in the IS area to be successful (see, e.g., Todd, McKeen, and Gallupe, 1995). Interestingly, these studies also point out just what it is about IS personnel that makes them so valuable to their organizations. In a nutshell, good IS personnel possess valuable, integrated knowledge and skills in three areas—technical, business, and systems—as outlined in Table 1.4.

TECHNICAL COMPETENCY. The technical competency area includes knowledge and skills in hardware, software, networking, and security. In a sense, this is the "nuts and bolts" of IS. This is not to say that the IS professional must be a high-level technical expert in these

TABLE 1.3 Some IS Management Job Titles and Brief Job Descriptions

Job Title	Job Description
CIO	Highest-ranking IS manager. Responsible for strategic planning and IS use throughout the firm
IS director	Responsible for managing all systems throughout the firm and the day-to-day operations of the entire IS unit
Division or account executive	Responsible for managing the day-to-day operations of all aspects of IS within one particular division, plant, functional business area, or product unit
Information center manager	Responsible for managing IS services, such as help desks, hotlines, training, consulting, and so on
Development manager	Responsible for coordinating and managing all new systems projects
Project manager	Responsible for managing a particular new systems project
Maintenance manager	Responsible for coordinating and managing all systems maintenance projects
Systems manager	Responsible for managing a particular existing system
IS planning manager	Responsible for developing an enterprise-wide hardware, software, and networking architecture and for planning for systems growth and change
Operations manager	Responsible for supervising the day-to-day operations of the data and/or computer center
Programming manager	Responsible for coordinating all application programming efforts
Systems programming manager	Responsible for coordinating support for maintenance of all systems software (e.g., operating systems, utilities, programming languages, and so on)
Manager of emerging technologies	Responsible for forecasting technology trends and for evaluating and experimenting with new technologies
Telecommunications manager	Responsible for coordinating and managing the entire voice and data network
Network manager	Responsible for managing one piece of the enterprise-wide network
Database administrator	Responsible for managing database and database management software use
Audit or computer security manager	Responsible for managing ethical and legal use of information systems within the firm
Quality assurance manager	Responsible for developing and monitoring standards and procedures to ensure that systems within the firm are accurate and of good quality
Webmaster	Responsible for managing the firm's Web site

areas. On the contrary, the IS professional must know just enough about these areas to understand how they work and how they can and should be applied. Typically, the IS professional manages or directs those who have deeper, more detailed technical knowledge.

The technical area of competency is, perhaps, the most difficult to maintain because the popularity of individual technologies is so fleeting. However, according to industry analysts, many programming jobs or support jobs will have been outsourced to third-party providers in the United States or abroad by 2010, so there is a shift in the hot skills the market will demand (Collett, 2006). While there is the need for a diverse set of technical skills such as network design or data warehousing, other easier-to-codify jobs will be automated or outsourced (see Table 1.5). In fact, many of the hot skills listed in Table 1.5 are focused on the business domain, which will be discussed next.

FIGURE 1.8

Information systems personnel are no longer nerds.

Past Present

TABLE 1.4 IS Professional Core Competencies

Domain	Description
Technical Knowledge and Skills	
Hardware	Hardware platforms, peripherals
Software	Operating systems, application software, drivers
Networking	Network operating systems, cabling and network interface cards, LANs, WANs, wireless, Internet, security
Business Knowledge and Skills	
Business integration, industry	Business processes, functional areas of business and their integration, industry characteristics
Managing people and projects	Planning, organizing, leading, controlling, managing people and projects
Social	Interpersonal, group dynamics, political
Communication	Verbal, written, and technological communication and presentation
Systems Knowledge and Skills	
Systems integration	Connectivity, compatibility, integrating subsystems and systems
Development methodologies	Steps in systems analysis and design, systems development life cycle, alternative development methodologies
Critical thinking	Challenging one's and others' assumptions and ideas
Problem solving	Information gathering and synthesis, problem identification, solution formulation, comparison, and choice

TABLE 1.5 Hot Skills for 2010 and Beyond

Domain	Hot	Cold
Business Domain	• Enterprise architecture • Project leadership • Business process modeling • Project planning, budgeting, and scheduling • Third-party provider management	
Technology Infrastructure and Services	• Systems analysis • Systems design • Network design • Systems auditing	• Programming • Routine coding • Systems testing • Support and help desk • Operations—server hosting, telecommunications, operating systems
Security	• IT security planning and management	• Continuity and recovery
Storage	• Storage administration	
Application	• Customer-facing application development	• Legacy systems development
Internet	• Customer-facing Web application systems • Artificial intelligence • Web mining • Data warehousing	
Business Intelligence	• Business intelligence • Data warehousing • Data mining	

Based on: Collett, 2006.

BUSINESS COMPETENCY. The business competency area is one that sets the IS professional apart from others who have only technical knowledge and skills, and in an era of increased outsourcing it may well save a person's job. For example, even though low-level technology jobs may be outsourced, MSNBC.com recently reported (http://www.msnbc.msn.com/id/5077435) that information systems management is one of ten professions that is not likely to be outsourced. As a result, it is absolutely vital for IS professionals to understand the technical areas *and* the nature of the business as well. IS professionals must also be able to understand and manage people and projects, not just the technology. These business skills propel IS professionals into project management and, ultimately, high-paying middle- and upper-level management positions.

SYSTEMS COMPETENCY. Systems competency is another area that sets the IS professional apart from others with only technical knowledge and skills. Those who understand how to build and integrate systems and how to solve problems will ultimately manage large, complex systems projects as well as manage those in the firm who have only technical knowledge and skills.

Perhaps now you can see why IS professionals are so valuable to their organizations. These individuals have a solid, integrated foundation in technical, business, and systems knowledge and skills. Perhaps most important, they also have the social skills to understand how to work well with and motivate others. It is these core competencies that continue to make IS professionals valuable employees.

Given how important technology is, what does this mean for your career? Technology is being used to radically change how business is conducted—from the way products and services are produced, distributed, and accounted for to the ways they are marketed and sold. Whether you are majoring in information systems, finance, accounting, operations management, human resource management, business law, or marketing, knowledge of technology is critical to a successful career in business.

Finding Qualified Personnel To effectively utilize information systems, organizations must have a highly trained workforce. Unfortunately, given the increased sophistication of modern information systems, organizations can often have a difficult time finding qualified personnel. In fact, finding the right people with the right skills is not possible in some areas. Consequently, over time, certain areas have become known for the availability of talented staff in a certain sector or with a certain set of skills, and thus organizations operating in that sector or relying on those skills tend to locate operations in such areas. Such areas are often characterized by a high quality of life for the people living there, and it is no surprise that many companies in the information technology sector within the United States are headquartered in Silicon Valley, California; Boston, Massachusetts; Austin, Texas; or Seattle, Washington. In other areas, organizations may have to find creative ways to attract and retain people from other areas.

One way to attract talented personnel is through creative human resource policies. For example, many organizations provide educational grants or expense-matching programs to encourage employees to improve their education and skills. Typically, after receiving continuing education benefits, employees must agree to remain with the organization for some specified period of time or be forced to repay the employer. Other human resource policies, such as telecommuting, flextime, and creative benefit packages, can also help to attract and retain the best employees.

With increasing globalization, other regions throughout the world are boasting about their highly skilled personnel. One such example is the Indian city of Bangalore, where, over a century ago, Maharajas started to lure talented technology-oriented people to the region, building a world-class human resource infrastructure that attracted companies from around the world. Although this has certainly helped to attract top Indian companies and multinational corporations alike, many companies have recently started complaining about other infrastructure issues, such as bad roads, power outages, housing conditions, traffic jams, and heavy rains. Clearly, for an area, just having a good human resource infrastructure is not sufficient, as organizations have to balance all their infrastructure needs when deciding where to move their headquarters or where to set up a new local subsidiary.

Powerful Partnerships

The Two Steves—Jobs & Wozniak

Steve Jobs, born in 1955, and Steve Wozniak, born in 1950—one of the most famous partnerships in the history of computing—combined their separate talents to form one of the most successful companies in IT—Apple Computers (see Figure 1.9). The two actually knew each other in high school, but renewed the friendship while Wozniak was working at Hewlett-Packard and Jobs took a summer job there. They visualized and designed the first marketable Apple computer (the Apple I), working first out of Jobs' bedroom, then out of a garage, and founded a company to sell their invention in 1976. The partners realized early on that they could probably sell one thousand computers a month, but as Wozniak recently wrote on his Web site, "That took a lot of money. We had none, so we went looking. We met Mark Markkula, and he launched us. I had to leave Hewlett Packard and that was tough."

The infusion of much-needed capital came just in time for Jobs and Wozniak to enter their product in the first West Coast Computer Faire. They rented a prime booth location and even managed to rent a video projector, a feat that Wozniak describes as follows: "This was such an early year that such projectors were virtually unknown. It was a BIG deal." The partners' professional business presentation at the Faire—far above other amateur efforts at the time—earned them several contracts for orders, and Apple Computers was off and running.

Both men left the company in 1985, less than ten years after founding it. Wozniak left to return to college, where he finally received his engineering degree under the pseudonym Rocky Clark. Steve Jobs, who stayed with Apple, persuaded John Sculley, the former CEO of Pepsi, to come aboard as captain. Ironically, Jobs and Sculley did not get along, and Sculley fired Jobs. Disillusioned, Jobs started his own company, called NeXT, which Apple eventually purchased, and in 1996, a wiser and less erratic Jobs again became Apple's chief executive. (Jobs was also the CEO and major shareholder of Pixar Animation Studios until Walt Disney Studios acquired the company in 2006.)

While Jobs and Wozniak differed widely in personality type and management style, the partners' abilities complemented each other and were an asset to the company they founded. Jobs, somewhat flamboyant and intuitive in anticipating which new concepts will capture consumers' imaginations, is still Apple Computer's CEO. Wozniak, a talented engineer, is more introverted and less willing than Jobs to assume center stage. "Woz" has founded several companies since leaving Apple, has taught children, and sponsors music festivals and charitable events. Furthermore, Wozniak is actually still on the payroll as an Apple employee. (He appreciates the 10 percent discount he gets when he buys Apple products.)

Many biographies have been written about the two Steves (*Inside Steve's Brain* by Leander Kahney is the latest about Jobs), and Wozniak has written his autobiography, *iWoz.* The books offer first-hand accounts of the fabled partnership and glimpses into the creation of one of the world's most successful computer companies.

FIGURE 1.9

Steve Jobs (left) and Steve Wozniak (right) of Apple Computer in the 1980s.

Based on:

Anonymous (n.d.). Woz.org . . . Everyone is welcome. Retrieved May 17, 2008, from http://www.woz.org.

Bellis, M. (n.d.). Inventors of the modern computer: The invention of the Apple Macintosh—Apple Computers—Steve Jobs and Steve Wozniak. *About.com.* Retrieved May 17, 2008, from http://inventors.about.com/library/weekly/aa051599.htm.

Hoyer, S. (2007, May 14). Interview: Steve Wozniak. *Macnotes.de.* Retrieved May 17, 2008, from http://www.macnotes.de/2007/05/14/interview-steve-wozniak-english-version.

Organizations: The Context of Information Systems

We have talked about data versus information, the technology side of IS, and the people side of IS. The last part of our IS definition is the term "organization." People use information systems to help their organization to be more productive and profitable, to help their firm gain competitive advantage, to help their firm reach more customers, or to improve service to their customers. This holds true for all types of organizations—professional, social, religious, educational, and governmental. In fact, not too long ago, the U.S. Internal Revenue Service launched its own site on the Web for the reasons just described (see Figure 1.10). The IRS Web site was so popular that approximately 220,000 users visited it during the first twenty-four hours and more than a million visited it in its first week—even before the Web address for the site was officially announced. Today, popular Web sites like MySpace.com and Yahoo.com receive millions of visitors every day.

Types of Information Systems Throughout this book, we will explore various types of information systems commonly used in organizations. It makes sense, however, for us to describe briefly here the various types of systems used so that you will better understand what we mean by the term "information system" as we use it throughout the rest of the book. Table 1.6 provides a list of the major types of information systems used in organizations.

Topping the list in the table are some of the more traditional, major categories that are used to describe information systems. These include *transaction processing systems, management information systems, executive information systems, decision support systems, intelligent systems, data mining and visualization systems, knowledge management systems, geographic information systems,* and *functional area information systems.* Five to ten years ago, it would have been typical to see systems that fell cleanly into one of these categories. Today, with **internetworking**—connecting host computers and their networks together to form even larger networks like the Internet—and **systems integration**—connecting separate information systems and data to improve business processes and decision making—it is difficult to say that any given information system fits into only one of these categories (e.g., that a system is a management information system only and nothing else). Modern-day information systems tend to span several of these categories of information systems, helping not only to collect data from throughout the firm and from customers, but also to integrate all that diverse data and present it to busy decision makers, along with tools to manipulate and

FIGURE 1.10

Web site of the U.S. Department of the Treasury, Internal Revenue Service, http://www.irs.gov.

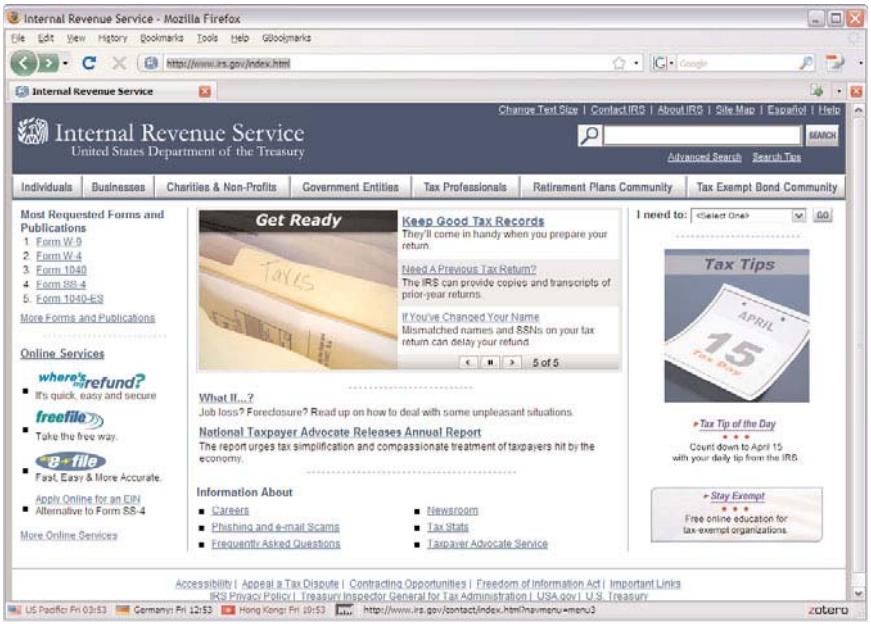


TABLE 1.6 Types of Information Systems Used in Organizations

Type of System	Purpose	Sample Application
Transaction processing system	Process day-to-day business event data at the operational level of the organization	Grocery store checkout cash register with connection to network
Management information system	Produce detailed information to help manage a firm or a part of the firm	Inventory management and planning system
Executive information system	Provide very high-level, aggregate information to support executive-level decision making	News retrieval and stock update information system
Decision support system	Provide analysis tools and access to databases in order to support quantitative decision making	Product demand forecasting system
Intelligent system	Emulate or enhance human capabilities	Automated system for analyzing bank loan applications
Data mining and visualization system	Methods and systems for analyzing data warehouses to better understand various aspects of a business	Market analysis
Office automation system (aka personal productivity software)	Support a wide range of predefined day-to-day work activities of individuals and small groups	Word processor
Collaboration system	Enable people to communicate, collaborate, and coordinate with each other	Electronic mail system with automated, shared calendar
Knowledge management system	Collection of technology-based tools to enable the generation, storage, sharing, and management of knowledge assets	Knowledge portal
Geographical information system (GIS)	Create, store, analyze, and manage spatial data	Site selection for new shopping mall
Functional area information system	Support the activities within a specific functional area of the firm	System for planning for personnel training and work assignments
Customer relationship management (CRM) system	Support interaction between the firm and its customers	Sales force automation
Enterprise resource planning (ERP) system	Support and integrate all facets of the business, including planning, manufacturing, sales, marketing, and so on	Financial, operations, and human resource management
Supply chain management (SCM) system	Support the coordination of suppliers, product or service production, and distribution	Procurement planning
Electronic commerce system	Enable customers to buy goods and services from a firm's Web site	Amazon.com

analyze those data. *Customer relationship management, supply chain management,* and *enterprise resource planning* systems are good examples of these types of systems that encompass many features and types of data and cannot easily be categorized.

Office automation systems and **collaboration systems** are typically bought "off the shelf" and enable people to (1) perform their own work and (2) work with others. A handful of software packages dominate this sector of the software industry and are commonly found on personal computers in people's homes and offices. Microsoft Office and the OpenOffice.org Productivity Suite are examples of popular office automation systems that provide word processing, spreadsheet, and other personal productivity tools. Microsoft's Exchange/Outlook and Lotus Notes are good examples of very popular collaboration systems that provide people with e-mail, automated calendaring, and online, threaded discussions.

Systems for electronic commerce, such as corporate Web sites, are also very popular and important. These systems are typically Internet-based and enable (1) consumers to find information about and to purchase goods and services from each other and from business firms and (2) business firms to electronically exchange products, services, and information. Given the pervasive use of the Internet to support electronic commerce, we devote a

great deal of time to this topic in subsequent chapters. In Chapter 4, we talk about the nuts and bolts of how the Internet works, and in Chapter 5, we talk about how people are using the Internet to conduct electronic commerce.

While many modern-day information systems span several of these IS categories, it is still useful to understand these categories. Doing so enables you to better understand the myriad approaches, goals, features, and functions of modern information systems.

We have talked about each of the parts of our definition of IS, and we have talked about different types of information systems. In the next section, we focus on how information systems can be managed within organizations.

Organizing the Information Systems Function The current emphasis on the use of technology within businesses is not a fad. Indeed, all indicators point to the increased use of technology and to organizations' continued awareness of the importance of technology, both as a tool for productivity and as a vehicle for achieving competitive advantage and organizational change. Just as information systems have evolved over the past several years, so too has the IS function. Next, we briefly review the evolution of the IS function within organizations.

EARLY HISTORY: POOR SERVICE AND WORSE ATTITUDES. Early IS departments typically had huge project backlogs, and IS personnel would often deliver systems that were over budget, were completed much too late, were difficult to use, and did not always work well. In addition, many of these old-school IS personnel believed they owned and controlled the computing resources, that they knew better than users did, and that they should tell users what they could and could not do with the computing resources. Needless to say, this was not a recipe for success and good relationships. Indeed, relations between IS personnel and users within a firm were often sour and were sometimes bitter.

THE RISE AND FALL OF END-USER DEVELOPMENT. In the early years of information systems within organizations, users were often forced to put up with the poor service and the poor attitude. Then technology started to become significantly better—faster, easier to build and use, and cheaper—with the advent of the personal computer (PC) and standard software packages (see Figure 1.11). As a result, end users began to develop their own computing applications using PC-based spreadsheet packages (e.g., Visicalc), database management systems (e.g., dBase), and programming languages (e.g., BASIC). Disgruntled users simply said, "If the IS staff cannot or will not do this for us, then we will

FIGURE 1.11

The advent of the IBM PC and early applications packages led to end-user development.

Source: http://www-03.ibm.com/ibm/history/exhibits/pc25/images/6705PH04.jpg

build our own systems." In many cases, they did just that, and they did it well, much to the dismay of some of the IS managers. Although end-user development clearly has strengths and still exists in some organizations, it also has serious weaknesses (see Chapter 10); thus, today, most organizations leave the systems development to the professionals.

THE MODERN INFORMATION SYSTEMS ORGANIZATION. Business managers soon became more savvy about technology and the possibilities and opportunities that it offered, and they reasoned that the possibilities and opportunities were too great to let the IS function simply wither away as end-user development took over. In addition, smart, concerned IS personnel realized that they needed an attitude adjustment. Some people believe that the changes in the nature of technology forced people to cooperate more. For example, the shift from large "mainframe" computers to a "server-centric" model (i.e., relatively powerful personal computers spread throughout the organization that share data, applications, or peripherals that are hosted by more powerful server computers—see Chapter 4) may have forced people within the IS function to improve their operations and their relationships with people in other units of the firm. The client-server model required a new kind of relationship between IS and other people throughout the firm (Stevens, 1994). As a result of these forces, in modern IS units that do a good job, the atmosphere, attitude, and culture are very different and much more sensitive and responsive than they used to be.

In these more responsive IS units, the personnel have taken on more of a consulting relationship with their users. The IS personnel believe that, fundamentally, they are there to help the users solve problems and be more productive. Indeed, in many cases, the IS personnel do not even refer to the users as "users." They are "clients" or "customers," or, even better, they are "colleagues" within the organization. This new attitude is a major change from the old days, when IS personnel did not want to be bothered by users and thought that the techies knew better than users. It is unfortunate that this old-school mentality still exists in some organizations.

The new IS culture is much like that found in successful service organizations. Think of how customers are treated in service organizations, such as Citigroup's Smith Barney or Ernst & Young, or in product-based organizations where service is also important, such as McDonald's or Nordstrom. Great service to the customer is absolutely critical, and employees do everything they can to please customers. They often live by the credo that "the customer is always right."

The same holds for IS units that have taken on this new **service mentality**. The IS personnel do everything they can to ensure that they are satisfying their systems customers within the firm. They reach out to customers and proactively seek their input and needs rather than waiting for customers to come in with systems complaints. They modify the systems at a moment's notice just to meet customer needs quickly and effectively. They celebrate the customer's new systems ideas rather than putting up roadblocks and giving reasons that the new ideas cannot or will not work. They fundamentally believe that the customers own the technology and the information and that the technology and information are there for the customers, not for the systems personnel. They create help desks, hotlines, information centers, and training centers to support customers. These service-oriented IS units structure the IS function so that it can better serve the customer.

The implications of this new service mentality for the IS function are staggering. It is simply amazing how unproductive a company can be when the IS personnel and other people within the firm are at odds with one another. On the other hand, it is even more amazing how productive and enjoyable work can be when people in the IS function work hand-in-hand with people throughout the organization. Technology is, potentially, the great lever, but it works best when people work together, not against each other, to use it.

The Spread of Technology in Organizations Another phenomenon that shows how integral and vital information systems and their proper management have become to organizations is the extent to which the technology is firmly integrated and entrenched within the various business units (such as accounting, sales, and marketing).

In many organizations today, you will find that the builders and managers of a particular information system or subsystem spend most of their time out in the business unit,

along with the users of that particular system. Many times, these systems personnel are permanently placed—with an office, desk, phone, and personal computer—in the business unit along with the users.

In addition, it is not uncommon for systems personnel to have formal education, training, and work experience in information systems as well as in the functional area that the system supports, such as finance. It is becoming increasingly more difficult to separate the technology from the business or the systems staff from the other people in the organization. For this reason, how information systems are managed is important to you, no matter what career option you pursue.

As information systems are used more broadly throughout organizations, IS personnel often have dual-reporting relationships—reporting to both the central IS group and the business function they serve. Therefore, at least some need for centralized IS planning, deployment, and management continues—particularly with respect to achieving economies of scale in systems acquisition and development and in optimizing systems integration, enterprise networking, and the like. Even in organizations that are decentralizing technology and related decisions, a need for technology and related decisions to be coordinated across the firm still persists. This coordination is likely to continue to happen through some form of a centralized (or, at least, centrally coordinated) IS staff. Organizations are likely to continue to want to reap the benefits of IS decentralization (flexibility, adaptability, and systems responsiveness), but it is equally likely that they will not want to—and will not be able to—forgo the benefits of IS centralization (coordination, economies of scale, compatibility, and connectivity).

Given the trend toward pushing people from the IS staff out into the various business units of the firm and given the need for people within each of the functional areas of the business to have technology skills, there is clearly a need for people who know the technology side *and* the business side of the business. We suspect that the need for people to play these boundary-spanning roles will continue.

Downsizing and Outsourcing Many organizations that are **downsizing**, or rightsizing as some call it, are looking for ways to streamline business functions and, in some cases, to slash costs and replace people. Often, these organizations try to use the IS function and technology as the lever for simultaneously shrinking the organization by reducing personnel headcount and making the organization more productive (i.e., doing more with less). Although this approach may not be fair for the people who lose their jobs, many firms are forced to do this to remain competitive and, in some cases, to continue to exist. Such uses of information systems have interesting implications for the size and structure of organizations and for the size and structure of the IS function.

Similarly, **outsourcing** is on the rise for all aspects of business. In outsourcing, many of the more routine jobs are "outsourced": these jobs and/or tasks are being conducted by people in another firm, in another part of the country, or on another continent at less cost (referred to as *offshore outsourcing*—see Chapter 2). Some of these outsourced jobs are within the information systems function. For example, many computer programming tasks are now being completed by firms in India and China. *CIO* magazine reported that although the United States leads the world when it comes to the number and quality of IS-related workers, outsourcing to low-wage countries has become a large and key component of managing most IS organizations. In 2006, the global market for outsourcing was $930 billion. By the end of 2009, the global market is projected to be worth more than $1.43 trillion. The outsourcing market for IT services alone was $233 billion in 2006. Additionally, by 2006, nearly 90 percent of all large organizations used some type of offshore outsourcing of business functions. What implications does that have for people considering careers in business or, in particular, in information systems?

Career Prospects and Opportunities Although technology continues to become easier to use, there is still and is likely to continue to be an acute need for people within the organization to have the responsibility of planning for, designing, developing, maintaining, and managing technologies. Much of this will happen within the business units and will be done by those with primarily business duties and tasks as opposed to systems duties and tasks. However, we are a long way from the day when technology is so easy to deploy that

a need no longer exists for people with advanced information systems knowledge and skills. In fact, many people believe that this day may never come. Although increasing numbers of people will incorporate systems responsibilities within their nonsystems jobs, there will continue to be a need for people with primarily systems responsibilities. In short, IS staffs and departments will likely continue to exist and play an important role in the foreseeable future.

While many organizations are downsizing and while some are shrinking their IS staffs and/or sending the more routine jobs abroad, overall hiring within IS is back again and is expected to grow. Given that information systems continue to be a critical tool for business success, it is not likely that IS departments will go away or even shrink significantly. Indeed, all projections are for long-term growth of IS in both scale and scope. Also, as is the case in any area of business, those people who are continually learning, continuing to grow, and continuing to find new ways to add value and who have advanced and/or unique skills will always be sought after, whether in information systems or in any area of the firm.

The future opportunities in the IS field are likely to be found in a variety of areas, which is good news for everyone. Diversity in the technology area can embrace us all. It really does not matter much which area of IS you choose to pursue—there will likely be a promising future there for you. Even if your career interests are outside IS, being a well-informed and capable user of information technologies will greatly enhance your career prospects.

Net Stats

Worldwide Internet Usage

In March 2008, 17.5 percent of the world's active Internet users were located in North America. This is down 2 percent from 2006 and down from about half in 2004. Overall, it was estimated that there were over 1.4 billion active Internet users worldwide: over 578 million users in Asia, 384 million in Europe, and 248 million in North America (about 215 million active users in the United States alone) (see Table 1.7). The Internet is most heavily used in North America, with 73.1 percent of the total population going online; Africa has the lowest penetration (percentage of a region's population using the Internet) with 5.3 percent. China has the most users with 253 million, followed by the United States. As the world continues to embrace the Internet, it is inevitable that the U.S. proportion will continue to get smaller. What do you think these statistics will look like in ten years? In twenty years?

Based on:

Anonymous (n.d.). World Internet usage statistics. Retrieved September 14, 2008, from http://www.internetworldstats.com/stats.htm.

TABLE 1.7 World Internet Usage and Population Statistics

World Regions	Population (2008 estimates)	Population (% of world)	Internet Usage, Latest Data	% Population (penetration)	Usage (% of world)	Usage Growth (2000–2008)
Africa	955,206,348	14.3%	**51,065,630**	5.3%	3.5%	1031.2%
Asia	3,776,181,949	56.6%	**578,538,257**	15.3%	39.5%	406.1%
Europe	800,401,065	12.0%	**384,633,765**	48.1%	26.3%	266.0%
Middle East	197,090,443	3.0%	**41,939,200**	21.3%	2.9%	1176.8%
North America	337,167,248	5.1%	**248,241,969**	73.6%	17.0%	129.6%
Latin America/ Caribbean	576,091,673	8.6%	**139,009,209**	24.1%	9.5%	669.3%
Oceania/Australia	33,981,562	0.5%	**20,204,331**	59.5%	1.4%	165.1%
World Total	6,676,120,288	100.0%	**1,463,632,351**	21.9%	100.0%	305.5%

Note: Internet usage and world population statistics were updated for June 30, 2008. ©Copyright 2008, Miniwatts Marketing Group. All rights reserved.

The Dual Nature of Information Systems

Given how important and expensive information systems have become, information technology is like a sword—you can use it effectively as a competitive weapon, but, as the old saying goes, those who live by the sword sometimes die by the sword. The two following cases illustrate this dual nature of information systems.

Case in Point: An Information System Gone Awry: London-Heathrow International Airport

What happens when an information system is implemented poorly? An example of an information system gone wrong that made the news in early 2008 is the automated baggage-handling system for the $8.5 billion Terminal 5 of London's Heathrow Airport, England's largest international airport (see Figure 1.12). Terminal 5, built for the exclusive use of British Airways, was built to handle up to 35 million passengers annually and was optimized for large airplanes flying long-haul international routes, such as the new Airbus A380.

Like the newly constructed terminal, the new automated baggage-handling system was intended to be amazing. Although management was aware that they could not afford the new terminal to be a proving ground, they also wanted to ensure that the system was state of the art. Due to the enormous complexity, it took 400,000 man-hours to develop the software for the baggage-handling system. In order to ensure performance, the manufacturer extensively used simulation and modeling even before the actual system was built. The system, which cost $500 million, included the following features:

- 11 miles of conveyor belts
- 8,500 electric motors
- Ability to handle up to 6,000 bags per hour
- 132 check-in stations
- Bag storage warehouse for 4,000 bags, each of which can be individually retrieved at any time
- 11 baggage claim belts

On the opening day of the terminal, the problems started. Due to problems in the software, the system misrouted cargo or reported that planes for which luggage was on the way had already left, so that luggage was stored for later flights, and many planes eventually left without luggage. Flights were cancelled, and only passengers traveling without checked luggage were checked in. After the first week of operation, 500 flights had been canceled and 28,000 misrouted bags had accumulated. In order to clear the chaos, several thousands of these bags were trucked to Milan, Italy, where they would be sorted and then delivered to the passengers. Analysts estimate the overall costs of the disaster to be up to $50 million.

FIGURE 1.12

Travelers waiting for their luggage at London's Heathrow Airport.

The story has a happy ending, or beginning, as it were. They fixed the software and the automated baggage system is now operational. Indeed, the baggage-handling system is one of many ways that this organization is attempting to be innovative and to outdo the competition. However, the airport is still useful as an example of how a problematic information system can adversely affect the performance of an organization.

Case in Point: An Information System That Works: FedEx

Just as there are examples of information systems gone wrong, there are many examples of information systems gone right. FedEx, now a $38 billion family of companies (2008 data), is the world's largest express transportation company and delivers millions of packages and millions of pounds of freight to 220 countries and territories each business day (see Figure 1.13). FedEx uses extensive, interconnected information systems to coordinate more than 290,000 employees, hundreds of aircraft, and tens of thousands of ground vehicles worldwide.

To improve its services and sustain a competitive advantage, FedEx offers extensive services on the Internet. FedEx.com has more than 15 million unique visitors per month and over 3 million tracking requests per day. FedEx.com has become the information hub for a business where managing information *is the business.* In addition to shipment tracking, customers use the site for finding out about delivery options and costs, use tools to prepare their own packages, verify them online, and print bar-coded shipping documents. These and other information systems have positioned FedEx as the global leader in express transportation.

Information Systems for Competitive Advantage

Heathrow's baggage-handling system and FedEx's Web site are typical of those used in large, complex organizations. These systems are so large in scale and scope that they are difficult to build. It is important to handle the development of such systems the right way the first time around. These examples also show that as we rely more and more on information systems, the capabilities of these systems are paramount to business success.

Not only were these systems large and complicated, but they were—and continue to be—critical to the success of the firms that built them. The choices made in developing the new systems at both London's Heathrow airport and FedEx were **strategic** in their intent. These systems were not developed solely because managers in these organizations wanted to do things faster or because they wanted to have the latest, greatest technology. These organizations developed these systems strategically to help gain or sustain some **competitive advantage** (Porter, 1985; Porter and Millar, 1985) over their rivals. Let us not let this notion slip by us—while the use of technology can enable efficiency and while information systems must provide a return on investment, technology use can also be strategic and can be a powerful enabler of competitive advantage.

FIGURE 1.13

FedEx is an innovator in successfully using information systems.

Ethical Dilemma

Online Rights Not Always Universal

American Internet users have been fortunate in that online content is not censored, and U.S.-based bloggers, journalists, and e-mailers are generally not subject to government intrusion or harassment. As the world becomes flatter, however, and the Internet becomes available to users in diverse countries, the question of who owns and/or controls Web-published data becomes an issue.

China has often been in the news for alleged violations of human rights. Since American companies have provided software and hardware for China's Internet infrastructure, the question arises, When China restricts online rights for its citizens, should U.S. companies providing services be cooperative? Consider the following:

- U.S.-based Cisco built the entire Chinese Internet infrastructure and allegedly agreed to supply equipment that allows the Chinese government to monitor Internet users.
- Chinese Internet users use Microsoft's blog tool, MSN Spaces. Microsoft censors the Chinese version of its software using a blacklist supplied by Beijing. Among words that will be automatically rejected by the Chinese system are "democracy" and "capitalism."
- In order to do business in China, in 2004 Google agreed to censor "subversive" articles from Google News China or from their search results.
- In 2005, Yahoo! was said to have aided the conviction of a Chinese journalist, Shi Tao, when employees of Yahoo!'s China office supplied details about Shi's e-mail address to local authorities. Mr. Shi, one of five journalists whose convictions for "revealing state secrets" Yahoo! allegedly aided, is currently serving a ten-year prison term in China.
- During the 2008 Olympic Games in Beijing, journalists were initially unable to access Web sites such as www.amnesty.org (the restrictions were later lessened after international protests).

Similar to Mr. Shi's situation, a Chinese journalist in Beijing recently posted content that, although probably factually correct, was deemed inappropriate by the Chinese government. The government then requested that Microsoft shut down the blog, and Microsoft complied. The Chinese government monitors all online activity, shutting down "dissident" Web sites and deleting "subversive" postings. Since Chinese bloggers often write under pseudonyms, the Chinese government has recently asked Internet access provider firms to reveal the identities of bloggers who post "inappropriate" content. As a result, several Chinese bloggers have been arrested and sentenced to lengthy jail terms after their identities were revealed.

Reporters Without Borders and other critics have called such censorship agreements unethical. Cisco, Microsoft, Google, and Yahoo! have replied that they are simply following local laws. Opponents argue, however, that online product and service providers based outside of China should not assist the Chinese government in its campaign against Internet users' online rights.

In reference to the company's involvement in Shi Tao's conviction and sentencing, Yahoo! twice faced congressional hearings and was denounced by human rights organizations and others in support of Shi Tao. Consequently, in 2007 Yahoo! settled a legal complaint filed by Shi's family for an undisclosed amount, and Yahoo! CEO Jerry Yang made a public apology to Shi's mother at a congressional hearing. In addition, Yahoo! established a Human Rights Fund to "provide humanitarian and legal assistance to persons in the People's Republic of China who have been imprisoned or persecuted for expressing their views using the Internet."

For human rights activists, the major issue is that American companies, such as Microsoft, Google, and Yahoo!, that profess to value free speech, are acting unethically when they cooperate with governments that curtail Internet users' rights to freedom of expression. The fact that Article 19 of the Universal Declaration of Human Rights supports freedom of expression lends legitimacy to this argument.

Another question that arises in such situations is, "Who owns Web-posted data?" Since the data is often not physically present in the local country supplying Internet access, do the local authorities have the right to censor the data? (Local authorities would probably argue that the impact of the content posted online is felt locally.) Do local authorities have a right to regulate online content when Internet access is hosted by companies located outside a country?

Most important, is the online environment independent of the digital world we live in, or is it subject to all the rules and regulations of countries the Internet passes through? Should the Internet adapt its own laws that all hosting companies must follow?

These are questions that will need to be answered in the twenty-first century as the world gets smaller and the Internet becomes an integral service in all countries.

Based on:

Barboza, D., & T. Zellar, Jr. (2006, January 8). Microsoft's shutdown of Chinese blog is condemned. *International Herald Tribune.* Retrieved May 17, 2008, from http://www.iht.com/articles/2006/01/06/technology/web.0107msft.php.

McKinnon, R. (2008, April). Asia's fight for web rights. *Far Eastern Economic Review.* Retrieved May 17, 2008, from http://feer.com/essays/2008/april/asias-fight-for-web-rights.

Pain, J. (2005, December 1). Perspective: A cyber blind spot on human rights. *CNET News.com.* Retrieved May 17, 2008, from http://news.com.com/A+cyber+blind+spot+on+human+rights/2010-1028_3-5977410.html.

Although we described information systems' uses at two relatively large organizations, firms of all types and sizes can use information systems to gain or sustain a competitive advantage over their rivals. Whether it is a small mom-and-pop boutique or a large government agency, every organization can find a way to use information technology to beat its rivals. In Chapter 3, we will talk more about this opportunity to use information systems strategically.

Why Information Systems Matter

On May 1, 2003, Nicholas Carr published an article titled "IT Doesn't Matter" in *Harvard Business Review* that created quite a stir. He argued that as IT becomes more pervasive, it will become more standardized and ubiquitous, more of a commodity that is absolutely necessary for every company. He reasoned then that companies should focus IT strictly on

Brief Case

Guerilla Wi-Fi

The digital divide refers to the "haves" and "have-nots" in the IT world. One Laptop per Child (OLPC), a nonprofit organization formed in 2005, attempts to overcome the digital divide, in part by providing low-cost computers to children who could otherwise not afford to buy them. However, just having a computer is not enough to join the club of the "haves," and even households that have computers do not always have access to affordable Internet connection services. One start-up company is addressing this problem: Meraki Networks, Inc., a three-year-old enterprise headed by Sanjit Biswas, an MIT student taking time off from working on his doctoral degree in computer science. (*Meraki* is a Greek word, meaning "inserting yourself into something you create.")

It has been determined that at least one billion people now connect to the Internet. Biswas' goal is to help the next billion, and the next after that, connect. The device the company sells to accomplish this is the $50 Mini—a wireless router about the size of two iPhones stacked up. The Mini can act like a "typical" wireless router, but the key to its individuality is its atypical software that allows Minis to "piggy-back," so that one Mini connected to the Internet can relay the connection through other Minis, thus forming a large network for Internet users. According to Biswas, Minis within line-of-sight (approximately 700 feet) allow a single DSL connection to accommodate up to fifty Internet users. In this way, a Mini network administrator can provide Internet connection service at nominal cost—perhaps as low as $1 per month. The drawback is that some Internet connection providers, such as Verizon and Time Warner, forbid subscribers from sharing connections. Less well-known providers, such as Speakeasy and bway.net, have no such restrictions.

Thanks to Biswas's Mini, the so-called "Guerilla Wi-Fi" phenomenon is spreading and helping former Internet connection have-nots to become connected—and part of the Internet community.

Questions

1. Should Internet providers be pressured to allow customers to share their connections with "non-paying" customers?
2. Would you share your connection with a total stranger even if it meant that you would sometimes experience a slowdown to your connection speed?

Based on:

Mims, C. (2007, August 6). Meraki's guerilla Wi-Fi to put a billion more people online. *Scientific American.* Retrieved May 17, 2008, from http://www.sciam.com/article.cfm?id=merakis-guerilla-wi-fi-to-put-billion-people-online.

cost reduction and risk mitigation and that investing in IT for differentiation or for competitive advantage is futile. Many experts in academia, in the popular press, and within technology companies not only disagreed with that argument but also felt that, if taken literally, such a line of thinking could hurt companies' competitiveness.

Given the debate that this article caused, on May 1, 2004, *CIO* magazine's editor in chief, Abbie Lundberg, published an interview with Carr on the subject, along with an invited counterpoint essay titled "The Engine That Drives Success: The Best Companies Have the Best Business Models Because They Have the Best IT Strategies" by noted technology and business strategy author Don Tapscott. Tapscott argued that companies with bad business models tend to fail regardless of whether they use information technology or not. On the other hand, companies that have good business models and use information technology successfully to carry out those business models tend to be very successful. He described many examples, across a variety of industries, where firms dominate their respective markets; have superior customer relationships, business designs, and differentiated offerings; and are well known for their superior use of IT in supporting a unique business strategy. His examples included Amazon.com, Best Buy, Citigroup, PepsiCo, Herman Miller, Cisco, Progressive Casualty Insurance, Marriott, FedEx, GE, Southwest Airlines, and Starbucks.

We tend to side with Tapscott on this one. We believe that information systems are a necessary part of doing business, that they can be used to create efficiencies, and that they can also be used as an enabler of competitive advantage. We do agree with Carr, however, that the competitive advantage from the use of information systems can be fleeting, as competitors can eventually do the same thing. Also, given how expensive information systems projects have become and given how cost conscious and competitive businesses now are, nearly every information system project today must show a clear return on investment. Again, we'll talk more about the role of information systems in competitive advantage and return on investment in Chapter 3 and throughout the book.

Industry Analysis

Business Career Outlook

In Chapter 2, we carefully examine how information systems are fueling globalization and tremendous changes throughout the world. Today, organizations are increasingly moving away from focusing exclusively on local markets. For example, PriceWaterhouseCoopers is focusing on forming overseas partnerships to increase its client base and to better serve the regions located away from its U.S. home. This means that it is not only more likely that you will need to travel overseas in your career or even take an overseas assignment, but it is also extremely likely that you will have to work with customers, suppliers, or colleagues from other parts of the world. Given this globalization trend, there is a shortage of business professionals with the necessary "global skills" for operating in the digital world. Three strategies for improving your skills include the following:

1. **Gain International Experience.** The first strategy is very straightforward. Simply put, by gaining international experiences, you will more likely possess the necessary cultural sensitivity to empathize with other cultures and, more important, you will be a valuable asset to any global organization.
2. **Learn More Than One Language.** A second strategy is to learn more than your native language. Language problems within global organizations are often hidden beneath the surface. Many people are embarrassed to admit when they don't completely understand a foreign colleague. Unfortunately, the miscommunication of important information can have disastrous effects on the business.
3. **Sensitize Yourself to Global Cultural and Political Issues.** A third strategy focuses on developing greater sensitivity to the various cultural and political differences within the world. Such sensitivity and awareness can be developed through coursework, seminars, and international travel. Understanding current events and the political climate of international colleagues will enhance communication, cohesiveness, and job performance.

In addition to these strategies, prior to making an international visit or taking an international assignment, there are many things you can do to improve your effectiveness as well as enhance your chances of having fun, including the following:

1. Read books, newspapers, magazines, and Web sites about the country.
2. Talk to people who already know the country and its culture.
3. Avoid literal translations of work materials, brochures, memos, and other important documents.
4. Watch locally produced television as well as monitor the local news through international news stations and Web sites.
5. After arriving in the new country, take time to tour local parks, monuments, museums, entertainment locations, and other cultural venues.
6. Share meals and breaks with local workers and discuss more than just work-related issues such as current local events and issues.
7. Learn several words and phrases in the local languages.

Regardless of what business profession you choose, globalization is a reality within the digital world. In addition to globalization, the proliferation of information systems is having specific ramifications for all business careers. This is discussed next.

For Accounting and Finance: In today's digital world, accounting and finance professionals rely heavily on information systems. Information systems are used to support various resource planning and control processes as well as to provide managers with up-to-date information. Accounting and finance professionals use a variety of information systems, networks, and databases to effectively perform their functions. In addition to changing the ways internal processes are managed and performed, information systems have also changed the ways organizations exchange financial information with suppliers, distributors, and customers. If you choose a career in accounting or finance, it is very likely that you will be working with various types of information systems every day.

For Operations Management: Information systems have also greatly changed the operations management profession. In the past, orders for supplies had to be placed over the phone, production processes had to be optimized using tedious calculations, and forecasts were sometimes only educated guesses. Today, enterprise resource planning and supply chain management systems have eliminated much of the "busywork" associated with making production forecasts and placing orders. Additionally, with the use of corporate extranets, companies are connecting to their suppliers' and distributors' networks, helping to reduce costs in procurement and distribution processes. If you choose operations management as your profession, the use of information systems will likely be a big part of your workday.

For Human Resources Management: The human resources management profession has experienced widespread use of information systems for recruiting employees via Internet job sites, distributing information through corporate intranets, or analyzing employee data stored in databases. In addition to using information systems within your daily work activities, you will also have to deal with other issues related to information systems use and misuse within your organization. For example, what are the best methods for motivating employees to use a system they do not want to use? What policies should you use regarding monitoring employee productivity or Internet misuse? If you choose human resource management as a profession, information systems have become an invaluable addition to the recruitment and management of personnel.

For Marketing: Information systems have changed the way organizations promote and sell their products. For example, business-to-consumer electronic commerce, enabled by the Internet, allows companies to directly interact with their customers without the need for intermediaries; likewise, customer relationship management systems facilitate the targeting of narrow market segments with highly personalized promotional campaigns. Marketing professionals must therefore be proficient in the use of various types of information systems in order to attract and retain loyal customers.

For Information Systems: Information systems have become a ubiquitous part of organizational life, where systems are used by all organizational levels and functions. Because of this, there is a growing need for professionals to develop and support these systems. To most effectively utilize the investment in information systems, professionals must be proficient in both business—management, marketing, finance, and accounting—and technology. In other words, information systems professionals must understand the business rationale for implementing a particular system as well as how organizations can use various systems to obtain a competitive advantage. Being able to bridge the business needs of the organization to information systems–based solutions will provide you with a competitive advantage in the job market.

Based on:

Treitel, R. (2000, October 9). Global Success. *Gantthead.com.* Retrieved May 17, 2008, from http://www.gantthead.com/articles/articlesPrint.cfm?ID=12706.

Key Points Review

1. ***Explain what an information system is, contrasting its data, technology, people, and organizational components.*** Information systems are combinations of hardware, software, and telecommunications networks that people build and use to collect, create, and distribute useful data, typically in organizational settings. When data are organized in a way that is useful to people, these data are defined as information. The term "information systems" is also used to represent the field in which people develop, use, manage, and study computer-based information systems in organizations. The field of IS is huge, diverse, and growing and encompasses many different people, purposes, systems, and technologies. The technology part of information systems is the hardware, software, and telecommunications networks. The people who build, manage, use, and study information systems make up the people component. They include systems analysts, systems programmers, information systems professors, and many others. Finally, information systems typically reside and are used within organizations, so they are said to have an organizational component. Together, these four aspects form an information system.
2. ***Describe types of jobs and career opportunities in information systems and in related fields.*** The people who help develop and manage systems in organizations include systems analysts, systems programmers, systems operators, network administrators, database administrators, systems designers, systems managers, and chief information officers. All of these types of people are in heavy demand; as a result, salaries are high and continue to rise. The field of IS has changed such that IS personnel are now thought of as valuable business professionals rather than as "nerds" or "techies." The need for technology-related knowledge and skills has spread to other careers as well in fields such as finance, accounting, operations management, human resource management, business law, and marketing.
3. ***Describe the dual nature of information systems in the success and failure of modern organizations.*** If information systems are conceived, designed, used, and managed effectively and strategically, then together with a sound business model they can enable organizations to be more effective, to be more productive, to expand their reach, and to gain or sustain competitive advantage over rivals. If information systems are not conceived, designed, used, or managed well, they can have negative effects on organizations such as loss of money, loss of time, loss of customers' goodwill, and, ultimately, loss of customers. Modern organizations that embrace and manage information systems effectively and strategically and combine that with sound business models tend to be the organizations that are successful and competitive.

Key Terms

chief information officer (CIO) 14
collaboration system 21
competitive advantage 27
computer-based information systems 11
data 8
downsizing 24
hardware 8
information 10
information systems (IS) 8
information technology (IT) 11
internetworking 20
knowledge 11
knowledge society 6
knowledge worker 5
new economy 6
office automation system 21
outsourcing 24
service mentality 23
software 8
strategic 27
systems integration 20
technology 11
telecommunications networks 8
wisdom 11

Review Questions

1. Define the term "knowledge worker." Who coined the term?
2. Describe and contrast the economic, cultural, and technological changes occurring in the digital world.
3. Define the term "information systems" (IS) and explain its data, technology, people, and organizational components.
4. Define and contrast data, information, knowledge, and wisdom.
5. Define and contrast technology, information technology, and information system.
6. Describe three or four types of jobs and career opportunities in information systems and in related fields.
7. What is a CIO, and why has the CIO grown in importance?
8. List and define three technical knowledge and/or skills core competencies.

9. List and define four business knowledge and/or skills core competencies.
10. List and define four of the systems knowledge and/or skills core competencies.
11. List and define five types of information systems used in organizations.
12. Describe the evolution of the information systems function within organizations.

Self-Study Questions

Visit the Interactive Study Guide on the Companion Web site for additional Self-Study Questions: www.pearsonhighered.com/valacich.

1. Information systems today are _____.
   A. slower than in the past
   B. continuing to evolve with improvements to the hardware and software
   C. utilized by only a few select individuals
   D. stable and should not change
2. Information systems are used in which of the following organizations:
   A. professional
   B. educational
   C. governmental
   D. all of the above
3. Whereas data are raw unformatted pieces or lists of words or numbers, information is _____.
   A. data that has been organized in a form that is useful
   B. accumulated knowledge
   C. what you put in your computer
   D. what your computer prints out for you
4. Computer-based information systems were described in this chapter as _____.
   A. any complicated technology that requires expert use
   B. a combination of hardware, software, and telecommunications networks that people build and use to collect, create, and distribute data
   C. any technology (mechanical or electronic) used to supplement, extend, or replace human, manual labor
   D. any technology used to leverage human capital
5. In the 1980s, which of the following became a popular new title given to executives who were responsible for the information systems function?
   A. CFO
   B. CIO
   C. CEO
   D. CMA
6. Other terms that can be used to represent the knowledge society include _____.
   A. the new economy
   B. the network society
   C. the digital world
   D. all of the above
7. Which of the following IS job titles is used for a person whose primary responsibility is directly doing maintenance on an information system?
   A. IS director
   B. maintenance manager
   C. systems analyst
   D. chief information officer
8. Which of the following is not classified as business knowledge and skills?
   A. management
   B. communication
   C. systems integration
   D. social
9. Which of the following was not discussed as a common type, or category, of information system used in organizations?
   A. transaction processing
   B. decision support
   C. enterprise resource planning
   D. Web graphics
10. Which of the following is not an example of an information system?
    A. an accounting system in a business
    B. a concession stand
    C. a combination of different software packages in a company
    D. a database of customers

Answers are on page 35.

Problems and Exercises

1. Match the following terms with the appropriate definitions:
   i. Wisdom
   ii. New economy
   iii. Information
   iv. Knowledge society
   v. Outsourcing
   vi. Systems integration
   vii. Downsizing
   viii. Chief information officer
   ix. Information systems
   x. Service mentality

   a. A society with a high proportion of knowledge workers who play an important leadership role
   b. An executive-level individual who has overall responsibilities for the information systems component within the organization and is concerned primarily with the effective integration of technology and business strategy
   c. Accumulated knowledge that represents broader, more generalized rules and schemas for understanding a specific domain or domains

d. The moving of routine jobs and/or tasks to people in another firm, in another part of the country, or in another country at less cost
e. Data that have been formatted in a way that is useful
f. The practice of slashing costs and streamlining operations by laying off employees
g. Connecting separate information systems and data to improve business processes and decision making
h. An economy in which information technology plays a significant role and enables producers of both the tangible (computers, shoes, etc.) and intangible (services, ideas, etc.) products to compete efficiently in global markets
i. The mind-set that your goal is to enable others to be successful and that the "customer is always right"
j. Combinations of hardware, software, and telecommunications networks that people build and use to collect, create, and distribute useful data, typically in organizational settings

2. Using the Web, research how FedEx has invested and updated its information systems and information technologies. List some of the most significant items and argue whether these investments have been good or bad. Discuss how you feel these investments affected FedEx's competitors.
3. Peter Drucker has defined the knowledge worker and knowledge society. What are his definitions? Do you agree with them? What examples can you give to support or disprove these concepts?
4. List three major IS professional core competencies or general areas from the textbook. Do you agree or disagree that all three are needed to become a professional? Why? What competencies do you currently possess, and what do you need to improve on or acquire? What is your strategy to acquire new skills? Where and when will you acquire them?
5. Of the several information systems listed in the chapter, how many do you have experience with? What systems would you like to work with? What types of systems do you encounter at the university you are attending? The Web is also a good source for additional information.
6. Consider an organization that you are familiar with, perhaps one that you have worked for or have done business with in the past. Describe the types of information systems that organization uses and tell whether they are useful or up to date. List specific examples for updating or installing information systems that improve productivity or efficiency.
7. Identify someone who works within the field of information systems as an information systems instructor, professor, or practitioner (e.g., as a systems analyst or systems manager). Find out why this individual got into this field and what this person likes and dislikes about working within the field of IS. What advice can this person offer to someone entering the field?
8. Based on your previous work and/or professional experiences, describe your relationships with the personnel in the IS department. Was the IS department easy to work with? Why or why not? Were projects and requests completed on time and correctly? What was the organizational structure of this IS department? How do your answers compare with those of other classmates?
9. As a small group, conduct a search on the Web for job placement services. Pick at least four of these services and find as many IS job titles as you can. You may want to try monster.com or careerbuilder.com. How many did you find? Were any of them different from those presented in this chapter? Could you determine the responsibilities of these positions based on the information given to you?
10. What type of IT/IS investment should Starbucks Coffee have, and how would it be used in the corporate office and the individual stores? What would it need in order to track inventory and sales? Search the Web or visit a Starbucks Coffee store in your city to determine whether you can see what technology is available in your local store.
11. The IS support group within the School of Business at Indiana University changed its name from "Business Computing Facility" to "Technology Services." Along with the change in name came an appropriate change in services and offerings to their clientele. Research the evolution of the information systems support function within your university or within a company. Make sure you track name changes, reporting structures, service orientation, and so on.
12. Contrast, using specific examples in your own life, technology, information technology, and computer-based information systems.
13. Do information systems matter to modern organizations? Why or why not?

Application Exercises

Note: The existing data files referenced in these exercises are available on the Student Companion Web site: www.prenhall.com/valacich.

Spreadsheet Application: Ticket Sales at Campus Travel

The local travel center, Campus Travel, has been losing sales. The presence of online ticketing Web sites, such as Travelocity.com and Expedia.com, has lured many students away. However, given the complexity of making international travel arrangements, Campus Travel could have a thriving and profitable business if it concentrated its efforts in this area. You have been asked by the director of sales and marketing to help with analyzing prior sales data in order to design better marketing strategies. Looking at these data, you realize that it is nearly impossible to perform a

detailed analysis of ticket sales given that it is not summarized or organized in a useful way to inform business decision making. The spreadsheet TicketSales.csv contains the ticket sales data for spring 2009. Your director has asked you for the following information regarding ticket sales. Modify the TicketSales.csv spreadsheet to provide the following information for your director:

1. The total number of tickets sold for each month.
   a. Select the data from the "tickets sold" column.
   b. Then select the autosum function.
2. The largest amount of tickets sold by a certain salesperson to any one location.
   a. Select the appropriate cell.
   b. Use the "MAX" function to calculate each salesperson's highest ticket total in one transaction.
3. The least amount of tickets sold by a certain salesperson to any one location.
   a. Select the appropriate cells.
   b. Use the "MIN" function to calculate the "least tickets sold."
4. The average number of tickets sold.
   a. Select the cells.
   b. Use the "AVERAGE" function to calculate the "average number of tickets sold" using the same data you had selected in the previous steps.

Database Application: Tracking Frequent Flier Miles at the Campus Travel Agency

The director of sales and marketing of the travel agency would like to increase the efficiency of handling those who have frequent flier accounts. Often, frequent fliers have regular travel routes or want to change their preferred seating area or meal category. In the previous years, the data has been manually entered in a three-ring binder. In order to handle the frequent fliers' requests more efficiently, your director has asked you to build an Access database containing the following information:

- Name (first and last name)
- Address
- Phone number
- Frequent flier number
- Frequent flier airline
- Meal category
- Preferred seating area

To do this, you will need to do the following:

1. Create an empty database named "frequent flier."
2. Import the data contained in the file FrequentFliers.txt using the function "Get external Data >> Import . . .".
   Hint: Use tab delimiters when importing the data; note that the first row contains field names.

After importing the data, create a report displaying the names and addresses of all frequent fliers by doing the following:

1. Select "Create report by using Wizard."
2. Include the fields "first name," "last name," and "address" in the report.
3. Save the report as "frequent fliers."

Team Work Exercise: How to Find Out What Is Current in IS

Visit a Web site of an information systems–related content provider, such as *InformationWeek, Computerworld, CIO* magazine, or *NewsFactor,* and scan the current headlines. You can find these online resources at www.informationweek.com, www.computerworld.com, www.cio.com, and www.newsfactor.com. After having scanned the headlines, get together with your team and discuss your findings. What is the focus of the different sites? What are the hot technologies and related issues? Which seem to be most important to business managers? Prepare a brief presentation for your classmates.

Answers to the Self-Study Questions

1. B, p. 7	**2.** D. p. 20	**3.** A, p. 10	**4.** B, p. 8	**5.** B, p. 14
6. D, p. 7	**7.** B, p. 16	**8.** C, p. 17	**9.** D, p. 21	**10.** B, p. 13

Case 1

Click Clique—Facebook.com

Facebook.com calls itself "a social utility that helps people better understand the world around them . . . through social networks allowing people to share information online the same way they do in the real world." That it does. In late 2008, Facebook reported the following user statistics:

- More than 100 million active users—"active" means a user has visited the site in the last thirty days.

- Over 55,000 regional, work-related, collegiate, and high school networks
- Half of all users are outside of college
- Fastest-growing group of users is 25 and older
- Maintained an 85 percent market share of four-year American universities
- Number one photo sharing application on the Web

Founded by a group of Harvard University students and launched in February 2004, Facebook was set to provide everything a college student needs to know about other students. Users list their interests ("soccer," "buying shoes"), friends, classes, and any other "tasteful" information about themselves. Anyone can form a subgroup within Facebook, such as "Cancer Corner" for smokers, "Collars Up!" for members who like to wear their shirts with the collars turned up, and the self-described "Republican Princesses." Many active members post detailed profiles of themselves and admit to logging on to browse Facebook four or five times a day.

While Facebook can help people get acquainted, it can also be used as a "weapon," according to some users. "It's communication lean" and a little fake, says an undergraduate sociology major at George Washington University. But even so, she logs on to the site whenever she has some spare time.

Initially, Facebook provided students with a private online directory that could be accessed only by people having an e-mail address ending in ".edu" (an ending that is usually reserved for educational institutions). This constraint was the major difference between Facebook and other online friendship and dating Web sites. Students registered on Facebook apparently felt safe in divulging personal information, probably because the network is closed to campus outsiders. In some instances, however, sororities and fraternities ask students not to list their Greek affiliations on Facebook to prevent potential pledges from researching which students are members of which sororities and fraternities. This restriction protects sorority and fraternity members from being constantly approached, both online and in person, and it also reduces animosity and competition between students vying for certain sororities and fraternities.

Over time, Facebook realized that the restriction to just students alienated a large number of people. What was founded as a social networking site just for Harvard students was opened up to college students throughout the United States, to high school students, and, in 2006, to anyone who wanted to join. To give its members the feeling of protection, the privacy controls were expanded, allowing people to prevent being included in search results and being contacted by people outside their networks. Further, Facebook's college and work networks require authenticated e-mail addresses to join.

Due to such restrictions, Facebook is also a good place for announcements—or not. For example, one student advertised a party in an off-campus apartment complex. As expected, fellow students who were on Facebook learned about the time and location of the party, but, unfortunately (for the host), a pair of roommates living next door to the party site also read about the party on Facebook. The pair of roommates dreaded the impending commotion and advised the police to be on alert that night. The party started mildly at 8:00 P.M. but got rowdy by 9:00 P.M. The police cars that were parked just outside the apartment complex stopped the party promptly at 10:00 P.M. to comply with the city's noise ordinance. The moral is, don't advertise an event on Facebook unless you want a crowd to show up.

To summarize, Facebook provides a popular networking service for college students and others. Anyone belonging to the Facebook community can access other members' profiles and browse their interests and friends. The "wall" is another popular feature. Anyone can post messages to a member's wall, and members can delete posted messages. Other Facebook features include adding photo albums, listing coming activities, and "poking," a ritual equivalent to a handshake. Facebook also provides rating scales for music, books, movies, television series, and other interests and activities.

Facebook is not the first or the only Web site to deliver social networking activities. Other social networking sites include Friendster, MySpace, Tribe Networks, LinkedIn, NamesDataBase, and Google's Orkut, all of which have features similar to Facebook. Social networking sites use a variety of techniques to increase user base. Some allow direct registration from their Web sites; others do not. Those that do not allow direct registration follow the "viral marketing" premise, by which only those who receive an invitation from a registered friend may be allowed to join the network. This process not only reinforces the networking philosophy but also makes sure that an entire circle of friends is registered on one site.

Venture capitalists have expressed an interest in funding online social networking because of the advertising prospects. When friends recommend a product or service to friends, an ad has more impact. Therefore, when marketers use online social networks, sales can increase exponentially. Recently, Microsoft outbid Google in a bid for a 1.6 percent stake in Facebook, eventually paying $240 million.

Because often the only source of revenue is advertisements placed on every page, many online social networks have not yet paid off financially for founders, but the concept has definitely proven popular with users and will continue to attract those who simply enjoy being part of a cybercommunity.

Questions

1. Do you use a social networking site like Facebook.com? If so, why? If not, why not?
2. Besides advertising, how else could a social networking site generate revenue?
3. What are the pros and cons of using a social networking site?

Based on:

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Naraine, R. (2004, February 13). Social networks in search of business models. *Internetnews.com.* Retrieved May 17, 2008, from http://www.internetnews.com/bus-news/article.php/3312491.

Microsoft invests $240 million in Facebook (2007, October 24). Retrieved May 17, 2008, from http://www.msnbc.msn.com/id/21458486.

Case 2

Are We There Yet?—Online Map Services

Everyone who drives a car and/or uses a computer is familiar with online map services. Three of the best and most frequently used are Google maps (http://maps.google.com), MSN's MapBlast (http://www.mapblast.com), and Yahoo! Maps (http://maps.yahoo.com). The service is free for computer users who want to find the shortest route from point A to point B and now extends to laptop and mobile phones as well. Google has been especially popular for its satellite views and features such as real-time traffic information (in places like Southern California), or the display of user generated content (e.g., landmarks or restaurant reviews) (some of the overly inclusive satellite imagery of military bases has recently been taken down following a request by the U.S. military).

Maps have become so popular with consumers that they have also become a for-profit enterprise. For example, all three of the above services provide a for-fee option for businesses with Web sites for adding easy-to-use, interactive maps online. With these applications, organizations can show customers how to reach stores or service centers in their areas, and employees on the road can more easily reach customers in various locations, or find hotels and restaurants in their travel areas. Organizations can also track shipments or supply chains, manage employees and resources in the field, and insert relevant advertising into their customized maps when they are displayed on Web sites.

Beyond posting maps for viewing on Web sites and mobile phones, mapping is entering the consumer mainstream as a profitable enterprise. For example, in 2007 Google struck a deal with a company called Gilbarco Veeder-Root, which makes "smart" gas pumps that include an Internet connection and a kiosk. At the pump kiosk, customers could scroll through several categories to find landmarks, hotels, restaurants, and hospitals selected by the gas station's owner. In the beginning customers could not enter specific addresses, but that feature was said to be in the works.

Also in 2007, Google announced an extension of its earlier "Send to Car" maps partnership with BMW—first implemented only in Germany. The feature had been extended to Italy and the UK and would eventually reach the United States. Mercedes Benz also announced deals with both Google and Yahoo! called "Search and Send," where customers could send maps from either search engine to the Mercedes in-car telematics system. Maps and directions could be sent to Mercedes with the system via desktop PCs and mobile phones.

Personal in-car navigation systems that rely on global satellite positioning (GSP) technology are quickly turning into more comprehensive mobile search platforms that can be used in the car—stationary or on the go—or out of the car. This positions in-car search as a promising arena for search engine development and competition, for extending features offered in vehicles, and for potential advertising revenue.

Questions

1. Do you use Internet mapping sites like Google maps? Why or why not?
2. As outlined in the case, there are many innovative mapping products and services; describe a new service that you want that doesn't yet exist.
3. Do you think that mapping software can be an invasion of privacy? Why or why not?

Based on:

Bass, S. (2005, June 29). Maps for fun and business. *PCWorld.* Retrieved May 17, 2008, from http://www.pcworld.com:80/article/id,121387/article.html.

Claburn, T. (2008, March 7). U.S. military restricts Google maps. *InformationWeek.* Retrieved May 17, 2008, from http://www.informationweek.com/news/security/government/howArticle.jhtml?articleID=206902500.

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