1 Managing in the Digital World

Preview

Today, organizations from Apple to Zappos use 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. In addition to helping organizations to be competitive, information systems have contributed to tremendous societal changes. Our objective for this chapter is to help you understand the role of information systems as we continue to move further into the digital world, the role of information systems in current issues faced by societies in the digital world, and the role of information technology (IT) megatrends in influencing the digital future. We then highlight 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. We conclude by discussing ethical issues associated with the use of information systems.

MANAGING IN THE DIGITAL WORLD:

Open Innovation

Where do good ideas come from? An eccentric inventor toiling alone? A secretive lab filled with researchers in white coats? Views of innovation are shifting away from these traditional stereotypes. For decades, corporations funded internal research and development units and tightly controlled both the inputs and outputs of these operations. Opportunities to interact with customers were limited, and the possibility of spending months or years and millions of dollars developing products that no one wanted was a real threat. New technologies are enabling a shift in the way innovation occurs.

Traditionally, universities would conduct basic and applied research, but the results of this research only sometimes would make their way to the private sector. Corporations would fund their own research and development operations, often at great expense. Such operations took years to set up and were often highly constrained in the types of research they could carry out. Programs of research were evaluated against business plans that had been studied, reviewed, and approved by multiple layers of management. The time and complexity involved in these bureaucratic processes often left the actual research out of date and out of touch with the realities of the marketplace and actual customer wants and needs. The resulting products

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

1. Describe the characteristics of the digital world, contemporary societal issues of the digital world, and IT megatrends shaping the digital future.
2. Explain what an information system is, contrasting its data, technology, people, and organizational components.
3. Describe the dual nature of information systems in the success and failure of modern organizations.
4. Describe how computer ethics affect the use of information systems and discuss the ethical concerns associated with information privacy and intellectual property.

would often fail in the market due to being years late or no longer being relevant.

Open innovation is a new approach. Instead of relying on tightly controlled internal research projects, companies are opening up their research and development efforts to a broad audience (Figure 1.1). Customers, suppliers, and other companies are invited to participate more directly in different phases of the innovation process, and companies are working more collaboratively with universities.

Many companies take these ideas even further and open up the research and development efforts to anyone who wishes to participate online or in person. For example, Starbucks introduced "My Starbucks Idea," where customers can post ideas and suggestions as well as vote on or discuss others' ideas. Hundreds of customer-generated ideas have been launched over the years. Likewise, more than 37,000 ideas have been submitted to Dell's "IdeaStorm" website, with more than 550 ideas implemented, and Heineken's "Innovators Brewhouse" uses open innovation to generate ideas related to topics ranging from methods for counterfeit detection to brewing closer to the consumer or new, more convenient packaging. Further, new tools like interactive 3D visualization and rapid prototyping technologies like 3D printing allow for tremendously lowered barriers to entry to innovation. Many companies and institutions have set up collaborative spaces to share resources and encourage the fusion of ideas and skills that can lead to exciting breakthroughs. As with many innovations themselves, this innovative way of innovating would not be possible without information systems.

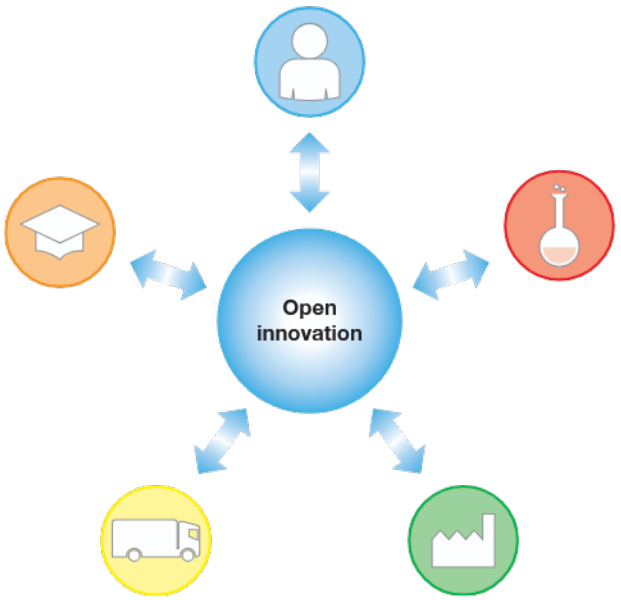


FIGURE 1.1

Open innovation entails opening up the innovation process to outside entities, including academia, individual innovators, research labs, other companies, or suppliers.

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

1. How do the five IT megatrends fuel open innovation?
2. What are the primary information systems components that enable open innovation?
3. What intellectual property issues arise from engaging in open innovation?

Based on:

Board of Innovation. (n.d.). List of open innovation and crowdsourcing examples. Retrieved June 20, 2016, from http://www.boardofinnovation.com/list-open-innovation-crowdsourcing-examples

GE. (2016). GE open innovation. *GE.com*. Retrieved April 24, 2016, from http://www.ge.com/about-us/openinnovation

Open Innovation Community. (2016). Open innovation. Retrieved April 24, 2016, from http://openinnovation.net/about-2/open-innovation-definition

Information Systems Today

Today, information systems (IS) are ubiquitous: Be it traditional desktop computers, laptop computers, smartphones, tablets, you name it; information systems are all around us, whether you see them or not. Companies such as FedEx and UPS use information systems to route trucks and track packages. Retailers such as Walgreens and Walmart use information systems for everything from optimizing supply chains to recording purchases and analyzing customer tastes and preferences. Cities use information systems for adaptive traffic control systems or variable speed limits. Cars use information systems for everything from ignition control to airbags to distance control and park assist systems. Many innovative business models, ranging from Airbnb to Uber, are built on or around information systems. Alternatively, just look around your school or place of work. At your school, you register for classes online; use e-mail, Twitter, or Facebook to communicate with fellow students and your instructors; access e-books from your library; and complete or submit assignments on online learning platforms such as Blackboard, Moodle, Canvas, or Sakai. At work, you may use a PC for e-mail and many other tasks. Your paychecks are probably generated by computer and automatically deposited into your bank account via high-speed networks. Even in your spare time, information systems are ubiquitous: You use social networking sites like Facebook to stay connected with your friends and family, you watch videos on YouTube, you upload pictures taken with your smartphone to picture-sharing sites like Instagram, you listen to music on Pandora or Spotify, and you use your smartphone for playing games, sending e-mails, or reading books. Chances are that each year you see more information systems than you did the year before, and these systems are a more fundamental and important part of your social, academic, and work life than ever before.

The Emergence of the Digital World

Over the past decades, the advent of powerful, relatively inexpensive, easy-to-use computers has had a major impact on business and society. When you stop and think about it, it is easy to see why information systems are 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. Many organizations use information systems to support innovative business models, or build their entire business models around technological innovations. Likewise, 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.

Clearly, we are living in a digital world. Given the proliferation of mobile devices such as tablets or smartphones, some have even argued that we are living in the post-PC era, where wireless, mobile devices will replace traditional desktop and laptop computers. In fact, already in the last quarter of 2011, Apple sold more iPads than HP (traditionally one of the world's leading PC makers) sold PCs, and in the United States, smartphone penetration has reached 82 percent (Nielsen, 2016). Initially created as consumer devices, tablets have become commonplace in various professional settings, including warehouses, showrooms, airplane cockpits, and hospitals (Figure 1.2).

Yet desktop PCs and laptops are unlikely to go away. Rather, devices with newer form factors will work in tandem with older form factors to provide truly ubiquitous experiences; mobile devices complement traditional computers, providing different devices for different users and different tasks, where not the device but the services and data provided are of primary importance. Further, the changes we've seen so far have given rise to developments such as wearable computers, augmented reality devices, or surface computers.

Changes in technology have enabled new ways of working and socializing; whereas traditionally, people were bound to a stationary PC to do essential tasks, they can now perform such tasks from almost anywhere they have a cell phone signal. Likewise, workdays traditionally had a clear beginning and a clear end—from when you powered your computer on to when you turned it off at night. Today, many tasks (especially more casual tasks such as reading or sending e-mails) can be done at any time, often in small chunks in between other tasks, such as when waiting in line at the supermarket cashier.

Computing has changed from an activity primarily focused on automating work to encompass various social and casual activities. Devices such as smartphones or tablets, paired with mobile broadband networks, allow for instant-on computing experiences, whenever and

FIGURE 1.2

Mobile devices are increasingly being used in various professional settings.
Source: William Perugini/Shutterstock.

wherever; advances in *cloud computing* (think Gmail, Office Online, or Dropbox) allow for accessing e-mails, files, notes, and the like, from different devices, further enhancing portability and mobility.

In effect, we are in a virtuous cycle (or in a vicious cycle, considering the creep of work life into people's leisure time and the increasing fixation on being permanently "on call"), where changes in technology lead to social changes and social changes shape technological changes. For example, communication, social networking, and online investing almost necessitate mobility and connectivity, as people have grown accustomed to checking e-mails, posting status updates, or checking on real-time stock quotes while on the go. In addition, the boundaries between work and leisure time are blurring, so that employees increasingly demand devices that can support both and often bring their own devices into the workplace.

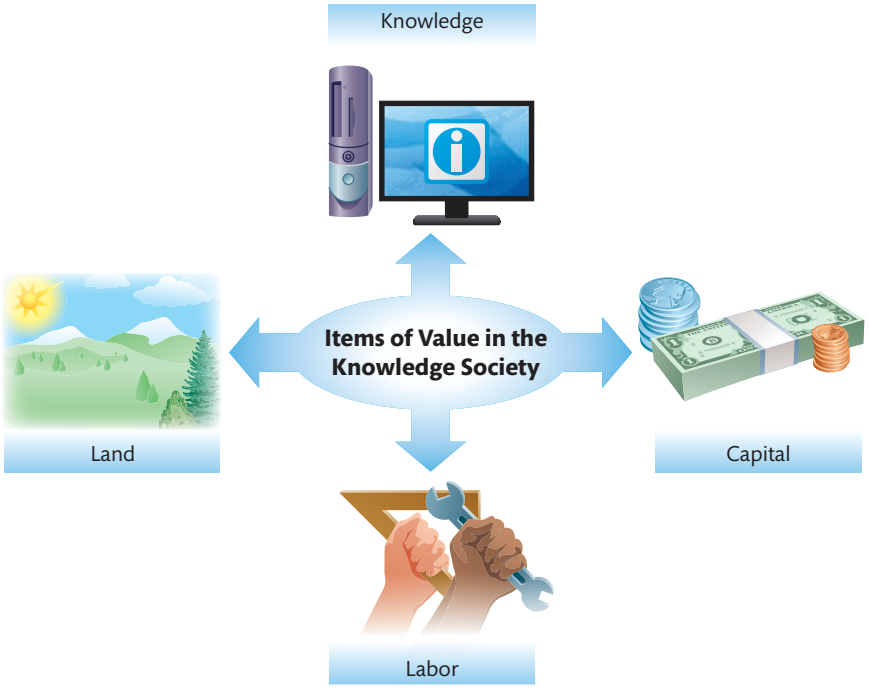
KNOWLEDGE WORKERS AND THE KNOWLEDGE SOCIETY. In 1959, Peter Drucker predicted that information and information systems would become increasingly important, and at that point, more than half a century ago, he coined the term **knowledge worker**. Knowledge workers are typically professionals who are relatively well educated and who create, modify, and/or synthesize knowledge as a fundamental part of their jobs.

Drucker's predictions about knowledge workers were 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. Knowledge workers 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) (Figure 1.3). 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, the most recent data from the U.S. Census Bureau's American Community Survey (2014 data) reinforce the value of a college education: Median earnings for workers 25 and over with a bachelor's degree were US$50,450 a year, while those for workers with a high school diploma were US$27,809. Median earnings for workers with a graduate or professional degree were US$66,175, and for those without a high school diploma US$20,542. These data suggest that a bachelor's degree is worth about US$1 million in additional lifetime earnings compared to a worker with only a high school diploma.

FIGURE 1.3

Knowledge has become as important as—and many feel more important than—land, labor, and capital resources.



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

Today, not only knowledge workers use information systems as integral parts of their work lives; many "traditional" occupations now increasingly use information systems—from the UPS package delivery person using global positioning system (GPS) technology to take the best route to deliver parcels to the farmer in Iowa who uses precision agriculture to plan the use of fertilizers to increase crop yield. In essence, (almost) every organization can now be considered an e-business. An **e-business** is an organization that uses information technologies or systems to support nearly every part of its business. Thus, the lines between "knowledge workers" and "manual workers" are blurring, to the point that some argue that "every worker is a knowledge worker" (Rosen, 2011).

THE DIGITAL DIVIDE. Some have argued, however, that there is a downside to being a knowledge worker and to living in the digital world. For example, some have argued that knowledge workers will be the first to be replaced by automation with information systems. Others have argued that in the new economy there is a **digital divide**, where those with access to information systems have great advantages over those without access to information systems. The digital divide is one of the major ethical challenges facing society today when you consider the strong linkage between computer literacy and a person's ability to compete in the digital world. For example, access to raw materials and money fueled the Industrial Revolution, "but in the informational society, the fuel, the power, is knowledge," emphasized John Kenneth Galbraith, an American economist who specialized in emerging trends in the U.S. economy. "One has now come to see a new class structure divided by those who have information and those who must function out of ignorance. This new class has its power not from money, not from land, but from knowledge" (Galbraith, 1987).

The good news is that the digital divide in America is rapidly shrinking, but there are still major challenges to overcome. In particular, people in rural communities, the elderly, people with disabilities, and minorities lag behind national averages for Internet access and computer literacy. Outside the United States and other developed countries, the gap gets even wider and the obstacles get much more difficult to overcome, particularly in the developing countries where infrastructure and financial resources are lacking. For example, most developing countries are lacking modern informational resources such as affordable Internet access or efficient electronic payment methods.

To be sure, there is a downside to overreliance on information systems, but one thing is for certain: Knowledge workers and information systems are now critical to the success of modern organizations, economies, and societies. At the same time, information systems play a crucial role in various major issues societies face. These issues are examined next.

Globalization and Societal Issues in the Digital World

The past decades have brought about a number of dramatic global changes, many of which will continue to influence individuals, businesses, economies, and societies well into the future. Many of such interrelated societal "megatrends," discussed by consulting firms such as PricewaterhouseCoopers (PwC) or Ernst & Young (EY), local and national governments, or global political and business leaders at the World Economic Forum, are related to ever-increasing **globalization**—the integration of economies throughout the world, enabled by innovation and technological progress (International Monetary Fund, 2002). 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.

COMING ATTRACTIONS

Memory Crystals

In the *Superman* films and many other sci-fi movies and books, characters make use of data storage devices that resemble large crystals. In the stories, these crystals often store incredibly large amounts of data and last for extraordinary lengths of time. Now scientists have taken a step toward making such technology a reality. Researchers at the University of Southampton (UK) have created a nanostructured glass storage device that resembles the fictional technologies. The technique uses self-assembling nanostructures written into fused quartz using tiny femtosecond (one-quadrillionth, or one-millionth of one-billionth, of a second) laser light pulses. The data are encoded in five dimensions (5D): height, length, width, position, and orientation. Using these multiple dimensions along with the nanoscale laser writing allows a small glass disc, about the size of a large coin, to store 360 terabytes (TB) of data. As a terabyte is equal to 1,024 gigabytes (GB), the amount of data stored on each tiny disk is several hundred times the amount of data stored on a standard desktop computer (1–4 TB) and several thousand times the data storage capacity of most smartphones (16–128 GB). The quartz material is highly stable (up to 13.8 billion years at 190 degrees Celsius), so data can be archived essentially forever.

To demonstrate the technology, the scientists recorded several major documents from human history on the disks, including the Universal Declaration of Human Rights, Newton's *Opticks*, the Magna Carta, and the King James Bible. The technology could be used by any organization or business seeking to store large volumes of data for long periods of time. Museums, libraries, national archives, and others could preserve their information and records for nearly unlimited time. Data stored using the technique could well outlast any other aspects of not just our technology but our civilization. Professor Peter Kazansky from the university's research team says: "It is thrilling to think that we have created the technology to preserve documents and information and store it in space for future generations. This technology can secure the last evidence of our civilization: all we've learnt will not be forgotten." The scientists are looking for industry partners to further develop and commercialize the technology.

Based on:

Mullen, M. (2016, February 17). New "Superman" crystals can store data for billions of years. *CNN Money*. Retrieved April 14, 2016, from http://money.cnn.com/2016/02/17/technology/5d-data-storage-memory-crystals/index.html

Phys.org. (2016, February 15). Eternal 5D data storage could record the history of humankind. Retrieved April 14, 2016, from http://phys.org/news/2016-02-eternal-5d-storage-history-humankind.html

GLOBALIZATION: OPPORTUNITIES AND CHALLENGES. For organizations, globalization has opened up many opportunities, brought about by falling transportation and telecommunication costs. Today, shipping a bottle of wine from Australia to Europe costs merely a few cents, and people can make voice or video calls around the globe for free using services such as Skype, Google Hangouts, or WhatsApp. To a large extent fueled by movies, television, and other forms of media, the increasing globalization has moved cultures closer together. The streaming movie provider Netflix is available in almost every country of the world, people in all corners of the world can receive television programming from other countries, and major movies are increasingly international. Developments such as these help create a shared understanding about norms of behavior or interaction, desirable goods or services, or even forms of government (though such shared understanding is still often lacking, and many of these developments have not yet happened). The rapid rise of a new middle class in many developing countries has enabled established companies to reach new markets, enabling them to sell their products to literally millions of new customers. At the same time, with the decrease in communication costs, companies can now draw on a large pool of skilled professionals from all over the globe. Countries such as Russia, China, and India offer high-quality education, leading to an ample supply of well-trained people at low cost. Some countries have even built entire industries around certain competencies, such as software development or tax preparation in India and call centers in Ireland.

The tremendous decrease in communication costs has increased the use of **outsourcing**—the moving of business processes or tasks (such as accounting, manufacturing, or security) to another company or another country—as now companies can outsource business processes on a global scale (Figure 1.4). Companies are choosing to outsource business activities for a variety of reasons; the most important reasons include the following (King, 2003):

- To reduce or control costs
- To free up internal resources
- To gain access to world-class capabilities
- To increase the revenue potential of the organization
- To reduce time to market
- To increase process efficiencies
- To be able to focus on core activities
- To compensate for a lack of specific capabilities or skills

Often, companies located in countries such as India can provide certain services much cheaper because of lower labor costs, or companies perform certain functions in a different country to reduce costs or harness skilled labor. For example, in India, two companies—Wipro and Infosys—have emerged as the leaders in providing IT services that range from business consulting to systems development. In addition, a wide variety of other services—ranging from telephone support to tax returns—are candidates for outsourcing to different countries, be it Ireland, China, or India. Even highly specialized services, such as reading of X-rays by skilled

FIGURE 1.4

Companies are outsourcing production to overseas countries (such as China) to utilize talented workers or reduce costs.
Source: Lianxun Zhang/Fotolia.

radiologists, are outsourced by U.S. hospitals to doctors around the globe, often while doctors in the United States are sleeping.

Yet globalization has also brought about a number of operational challenges for organizations. Organizations face governmental challenges related to differences in political systems, regulatory environments, laws, standards, or individual freedoms. Likewise, geoeconomic challenges include differences in infrastructure, demographics, welfare, or workers' expertise. Lastly, organizations face cultural challenges, such as dealing with differences in languages, beliefs, attitudes, religions, or life focus but also different viewpoints regarding intellectual property. As a result, companies intending to outsource services or production have to carefully choose outsourcing locations, considering numerous different factors, such as English proficiency, salaries, or geopolitical risk. While countries such as India remain popular, other formerly popular countries (such as Singapore, Canada, or Ireland) are declining because of rising salaries. With these shifts, outsourcers are constantly looking at nascent and emerging countries such as Bulgaria, Egypt, Ghana, Bangladesh, or Vietnam.

Obviously, organizations have to weigh the potential benefits (e.g., cost savings) and drawbacks (e.g., higher geopolitical risk or less experienced workers) of outsourcing to a particular country, and often, cost savings prove to be negligible due to added overhead, such as customs, shipping, or training as well as quality problems. In fact, *InformationWeek*, a leading publication targeting business IT users, found that 20 percent of the 500 most innovative companies in terms of using IT took back projects previously outsourced to another country. Nevertheless, IT outsourcing is big business: Research firm IDC forecasted the market for IT outsourcing to be $103 billion in 2019 (Tapper, 2015).

SOCIETAL ISSUES IN THE DIGITAL WORLD. The rapid development of transportation and telecommunication technologies, national and global infrastructures, and information systems as well as a host of other factors has created a number of pressing societal issues that will tremendously influence the world we live in (PWC, 2016; Schreiber, 2016). In this section, we will highlight a few of these issues (Figure 1.5). One such issue is **demographic changes**—changes in the structure of populations such as related to age, birth rates, and migration. While many countries in the developed world see rapidly aging populations, developing regions such as Africa are expected to rapidly rise in population, fueling a massive global population growth. These differences in demographic changes will also shift the balance of demand and supply of labor; further, differences in welfare are likely to further increase, and many countries are already experiencing both positive and negative effects of mass migrations. In addition, many regions of the world are seeing rapid **urbanization**—the movement of rural populations to urban areas, to a point where 50 percent of the world's population is now living in cities (PWC, 2016); sustaining this growth while providing livable environments for the inhabitants will pose major challenges. Another major trend is the global **shifts in economic power**—changes in countries' purchasing power and control over natural resources—where established economies are losing

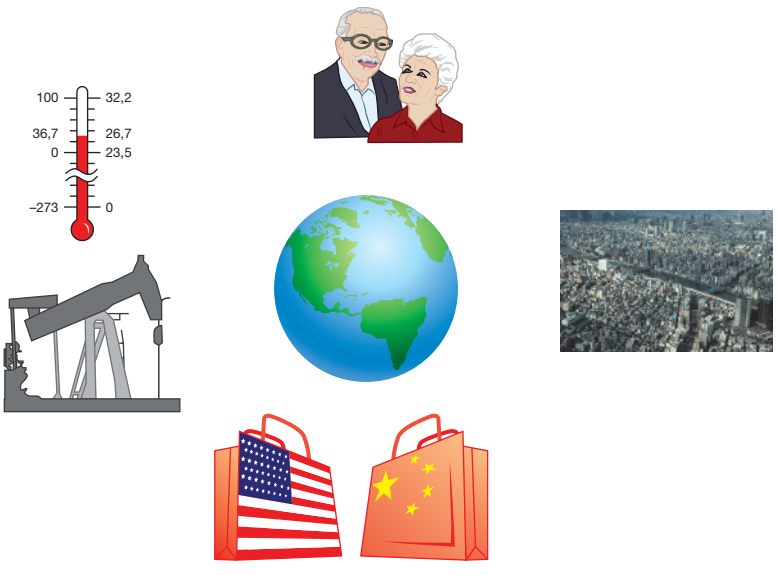


FIGURE 1.5

Societal issues in the digital world.
Source: Pichaitun/Fotolia.

their dominating positions in the world's economy, resulting in the need to resolve political struggles (PWC, 2016). Many of these issues interact, affect each other, and/or fuel other issues, such as issues related to **resource scarcity** due to limited availability of fossil fuels and other natural resources and **climate change**—large-scale and long-term regional and global changes in temperatures and weather patterns. Population growth, global trade, consumerism, and other factors contribute to increasing waste and pollution, as well as a growing need for resources, at a time where humans already live beyond the finite natural resources the planet can provide. Likewise, climate change—regardless of its causes—and its associated changes in weather patterns, rise in sea levels, and increase in the severity of storms pose a number of challenges for individuals, societies, and the world. As a consequence, **sustainable development**—"development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987)—will become an ever increasingly important aspect. In addition to these societal issues, we have witnessed a number of breakthroughs and transformations enabled by technology; these breakthroughs are disrupting traditional business models but can also help address pressing societal issues. Next we will discuss five IT megatrends that shape the digital future.

Five IT Megatrends That Shape the Digital Future

In most developed societies, information technologies have become pervasive—information technologies are in fact used throughout society, and the speed of innovations is increasing at a tremendous pace, with many *radical innovations* marginalizing or displacing existing products or industries (see Chapter 2, "Gaining Competitive Advantage Through Information Systems").

WHO'S GOING MOBILE

Wearable Technologies

For a long time, the smart fridge has been touted as the prime example of possibilities enabled by the *Internet of Things*, a network of physical objects that are connected over the Internet. While the smart fridge has yet to take off, many much smaller "things" have become tremendously popular—wearable technologies, such as smartwatches or activity trackers. The term **wearable technologies** refers to clothing or accessories that incorporate electronic technologies. For example, the Apple Watch, Samsung's Galaxy Gear, or the Fitbit incorporate various sensors; depending on the device, the sensors record physiological data such as body movements or heart rate but also environmental data such as ambient light, orientation, or altitude. Smartwatches such as the Apple Watch or Samsung's Galaxy Gear are designed to be an extension of the user's phones, used to display notifications from the phone or tablet devices, providing quick access to some of the phone's or tablet's functions, in addition to enabling the user to monitor various fitness activities. Activity trackers such as the Fitbit are designed to be worn and passively used on a regular basis, supporting the "**quantified self**"—the logging of all aspects of one's daily life, ranging from monitoring and recording of activities, performance, or intakes to monitoring bodily states (such as moods or physiological data) to improve one's overall health and performance. Yet other devices are intended for special use cases—as in the "Climbax," a rock-climbing device that tracks your climbing technique.

Whereas many wearable technologies are designed to support the quantified self, many see social relationships as the next big thing in wearables and experiment with social wearables that allow users to connect with each other in novel ways. For example, experimental concepts include a social fan jersey, which allows sports fans to experience vibration patterns as their favorite rugby player hits the ground. Many of these technologies are both exciting and futuristic, but there remain security, privacy, and other issues to resolve: Early wearable devices have been demonstrated to be easily hackable, and there is also broad concern about the potential distractions to automobile drivers or students in classrooms from such wearable devices. While offering great promises, these exciting technologies will require adjustments and compromises if they are to obtain the extensive adoption their manufacturers are aiming for.

Based on:

Cosco, A. (2016, March 7). The social age of wearable tech: From quantified self to emotional second skin. *Wareable*. Retrieved March 18, 2016, from http://www.wareable.com/wearable-tech/the-social-age-of-wearable-tech-beyond-the-quantified-self

Green, C. (2014, May 12). Wearable technology creates $50 billion investment frenzy. *Information Age*. Retrieved March 18, 2016, from http://www.information-age.com/technology/mobile-and-networking/123457988/wearable-technology-creates-50-billion-investment-frenzy

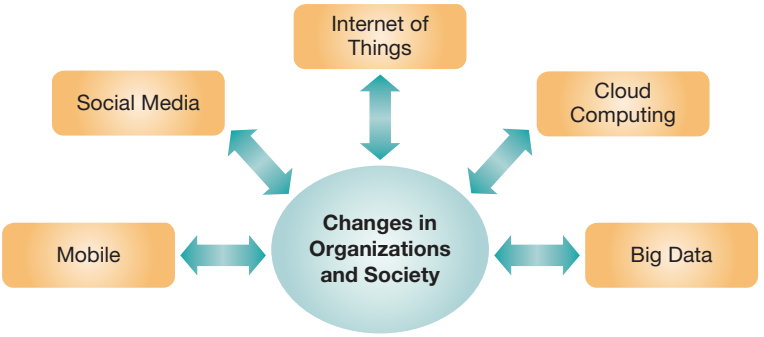


FIGURE 1.6
Five IT megatrends.

For example, within just a few years, drones evolved from being primarily used by the military to being used by farmers, aerial photographers, filmmakers, and hobbyists alike. Self-parking systems are already available in many vehicles, self-driving cars and trucks are being actively tested by various companies, and autonomous Caterpillar mining trucks are already in use. Likewise, the development of sophisticated web technologies has brought about a fundamental shift in types of information technologies that are being used, and we're seeing five (intertwined) "megatrends" that influence individuals, organizations, and society (Figure 1.6). Understanding the influence of these megatrends will be increasingly important: Individuals will increasingly feel the impact of these megatrends on their private and work lives, and businesses need to have a business strategy that is fit for today's digital world and the digital future.

- ***Mobile.*** One of the biggest trends we're seeing today is the move toward mobile devices, as indicated in the opening section of this chapter. In most developed countries, the vast majority of adults have a mobile phone, and typically, people have their mobile phones within their reach 24/7. Compare that with the access to your laptop or PC. In the developing world, mobile devices are frequently seen leapfrogging traditional PCs; owing to the lack of stable, reliable power or landline telephone infrastructure, mobile devices are often the primary means of accessing the Internet. For organizations, this increase in mobility has a wide range of implications, from increased collaboration to the ability to manage a business in real time—at any time, from anywhere—to changes in the way new (or existing) customers can be reached (Figure 1.7). With the increase in mobile devices, organizations not only have to create mobile-device-friendly versions of their websites but often

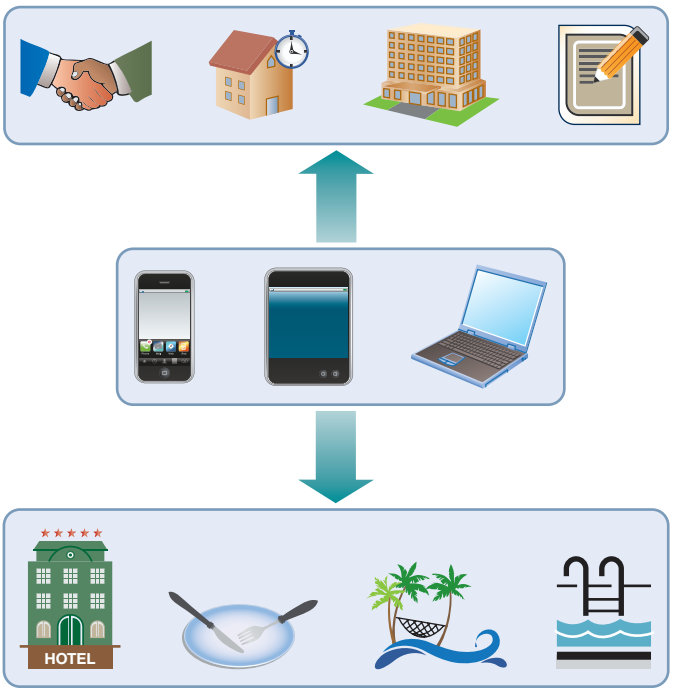


FIGURE 1.7
Mobile devices allow running business in real time—at any time, from anywhere.

build mobile **apps** (software programs designed to perform a particular, well-defined function) to market their products or services. In addition, fueled by advances in consumer-oriented mobile devices (such as smartphones and tablets) and the ability to access data and applications "in the cloud," today's employees are increasingly using their own devices for work-related purposes or are using software they are used to (such as social networks for communicating) in the workplace. While initially, workers tended to use their own devices primarily for checking e-mails or visiting social networking sites, they now use their own devices for various other important tasks, including customer relationship management or enterprise resource planning. For organizations, this trend can be worrying (due to concerns related to security or compliance or increasing need to support the workers' own devices), but it can also provide a host of opportunities, such as increased productivity, higher retention rates of talented employees, or higher customer satisfaction. Managing this trend of "bring your own device" (**BYOD**) is clearly a major concern of business and IT managers alike. Further, we have witnessed the **consumerization of IT**; many technological innovations are first introduced in the consumer marketplace before being used by organizations, and businesses have to constantly evaluate how a wide variety of new technologies might influence their ways of doing business. Throughout the text, we will introduce issues and new developments associated with increases in mobility.

- ***Social Media.*** A second megatrend, as you have undoubtedly noticed, is social media. The rise of social media is largely based on the **network effect**—referring to the notion that the value of a network (or tool or application based on a network) increases with the number of other users. In other words, if a network has few users, it has little or no value. You may be one of the more than 1.6 billion (and growing) Facebook users who share status updates or pictures with friends and family, or you may use apps such as Snapchat, Twitter, or WhatsApp to communicate with your friends. How useful would these social media platforms be if none of your friends or family members had access to them? Today, the use of social media has gone way beyond friends and families. University professors use social networks to provide students with updates about course-related topics, and organizations use social media to encourage employee collaboration or to connect with their customers (Figure 1.8). In addition, companies can harness the power of the crowd by using social media to get people to participate in innovation and other activities. With the rise of social media, we have witnessed a shift in roles, where users are not mere consumers of information but have become important creators and contributors. As you can imagine, social media are here to stay; while we will touch on social media–related aspects throughout the book, we will devote Chapter 5, "Enhancing Organizational Communication and Collaboration Using Social Media," to social media and related topics.
- ***The Internet of Things.*** A third megatrend is the **Internet of Things (IoT)**—a network of a broad range of physical objects that can automatically share data over the Internet. Such objects (or "things") can range from an automobile tire equipped with a pressure sensor to a smart meter enabling remote monitoring of energy consumption to a cow with an injectable ID chip. Already in 2008, more devices were connected to the Internet than there were people living on earth. Fueled by advances in chips and wireless radios and decreasing costs of **sensors** (devices that can detect, record, and report changes in the physical environment), in the not-too-distant future everything that can generate useful information

FIGURE 1.8

Social media are used in various personal and business settings.

will be equipped with sensors and wireless radios (Figure 1.9). In other words, anything that can generate data or uses data can be connected, accessed, or controlled via the Internet (sometimes referred to as "pervasive computing"). With the ability to connect "things" such as sensors, meters, signals, motors, actuators, or cameras, the potential for gathering useful data is almost limitless. For example, the market for **smart home technologies** (sometimes called **home automation**)—technologies enabling the remote monitoring and controlling of lighting, heating, or home appliances—such as the Nest Learning Thermostat, is expected to reach almost US$60 billion by 2020. Using smart home technology, one can monitor home temperatures when on vacation or remotely adjust the air-conditioning; likewise, sensors integrated in a road's surface can monitor temperatures and trigger dynamic speed limits in case there is the risk of ice or snow. Similarly, sensors can monitor availability of parking spaces or traffic flow, alerting drivers of changes in conditions. Millions of sensors connected to the Internet can monitor weather conditions, helping to generate more accurate local weather predictions, or can monitor soil moisture in golf courses, reducing the need for watering. Cardiac monitors can alert physicians of patients' health risks. The use of IoT technologies in manufacturing—referred to as **Industrial Internet of Things (IIoT)**—enables the convergence of information technology and operations technology, offering the potential for tremendous improvements in efficiency, product quality, agility, and flexibility, allowing companies to mass-produce customized products, better monitor supply chains, and so on. In sum, the applications of sensor technology for home automation, smart cities, smart metering, smart farming, e-health, manufacturing, and other areas are almost limitless. As the number of sensors and devices connected to the Internet grows, the Internet of Things will evolve to become the Internet of Everything (IoE), where just about any device's functionality is enhanced through connectivity and intelligence.

- ***Cloud Computing.*** The fourth megatrend is **cloud computing**. Whereas traditionally each user would install a number of different applications for various tasks—from creating documents to listening to music—as well as store documents, pictures, and other data on

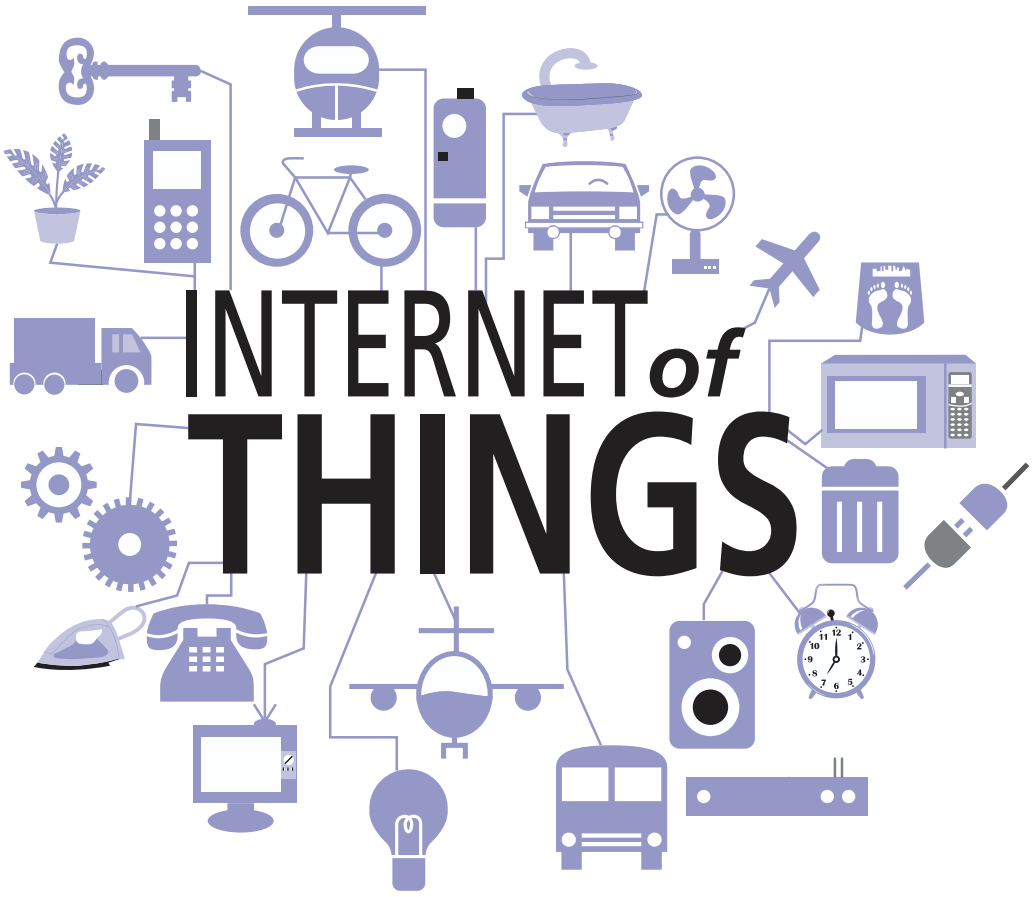


FIGURE 1.9
The Internet of Things.

FIGURE 1.10

Applications and data stored in the cloud can be accessed from different devices.

his or her computer, web technologies enable using the Internet as the platform for applications and data. Now, much of the functionality previously offered by applications installed on each individual computer is offered by applications "in the cloud," accessed via a web browser. Increasingly, not only the applications but also the data reside in the cloud, to be accessed at any time from anywhere (Figure 1.10). A good example of cloud computing is the various services offered by Google, such as Gmail (e-mail), Google Docs (word processing), and Google Calendar, all of which are accessed via a web browser, freeing users from the task of installing or updating traditional desktop applications or worrying about storing or backing up data. Cloud computing has made inroads in a variety of organizational applications, and many organizations rely on an information systems infrastructure in the cloud. Further, cloud computing can enable advanced analytics of massive amounts of Big Data generated by mobile devices, sensors, or users of social networks. We will extensively discuss cloud computing in Chapter 3, "Managing the Information Systems Infrastructure and Services."

- ***Big Data.*** Together, these transformations of our social and work interactions enabled by 24/7 connectivity have given rise to a fifth trend, **Big Data**. Big Data are typically described as extremely large and complex datasets, which are characterized as being of high volume, variety (i.e., many different types of data), and velocity (i.e., the data are being collected and analyzed at ever-increasing rates). Following the old adage that information is power, organizations are continuously seeking to get the right information to make the best business decisions. Yet organizations are generating and collecting ever more data from internal and external sources. The rise of social media has further increased the amount of unstructured data available to organizations; for example, people frequently voice their thoughts about products or companies on blogs or social networks. In addition, the Internet of Things, allowing for connecting devices and sensors to the Internet, further contributes to the growth of data available to organizations and individuals. With decreasing costs for capturing and storing data, data are now not only ubiquitous but also cheap. A study by research firm IDC estimated that in 2013, 4.4 zettabytes of data were generated and consumed. How much is 4.4 zettabytes? Well, 4.4 zettabytes equals 4.4 trillion gigabytes, or the equivalent of 32 billion 128GB iPads. As the number of devices connected to the Internet is expected to reach 30 billion in 2020, the amount of digital data generated worldwide is forecast to reach 44 zettabytes in 2020 and 180 zettabytes by 2025. For many organizations today, value is created from data. Consider, for example, that the largest/most valuable organizations in the "old economy" (such as GE, Dow, or Ford) have 100,000–300,000 employees, and the largest organizations in the "new economy" (such as Microsoft, HP, or Oracle) have 50,000–100,000 employees; in contrast, modern companies of the digital world (such as Facebook, Twitter, or Groupon) have risen to the top with a mere 5,000–15,000 employees by creating value from data (Hofmann, 2011) (Figure 1.11). Ever-increasing amounts of data increase the ability to detect meaningful relationships and regularities, and insights gained from analyzing Big Data not only can contribute to business success but can also help to address some of the tremendous challenges society faces.

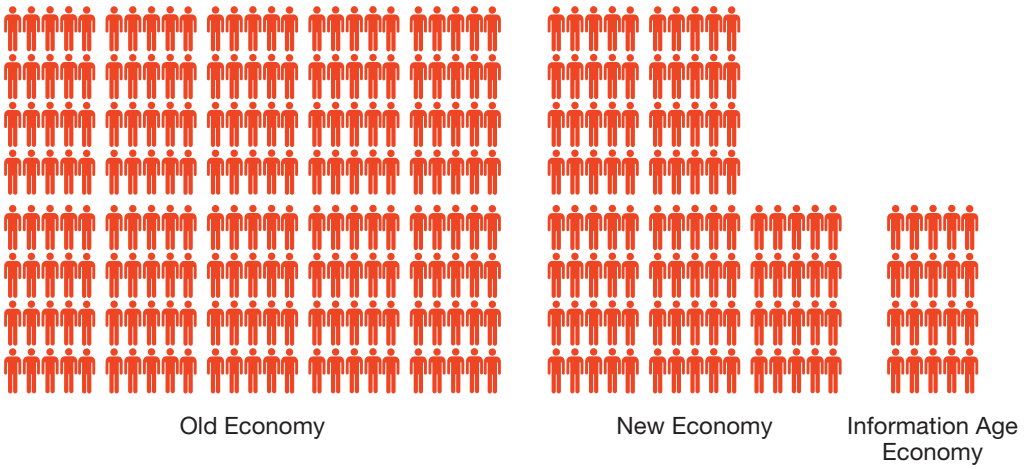


FIGURE 1.11

Companies in the Information Age economy are creating value not from people but from data.

For example, Big Data is a key factor enabling research ranging from genomics to climate change. However, analyzing tremendous amounts of (often unstructured) data (i.e., Big Data) poses tremendous challenges for organizations. In Chapter 6, "Enhancing Business Intelligence Using Big Data and Analytics," we will discuss how organizations can harness Big Data to make better business decisions.

Just as the societal issues interact and affect each other, so do the IT megatrends. For example, cloud computing allows for generating new machine learning algorithms to analyze Big Data, continuously improving *artificial intelligence* capabilities. Similarly, continuous input from various sensors, paired with artificial intelligence to make sense of such Big Data streams, enables tremendous advances in **robotics** (i.e., the use of robots to perform manual tasks). The different megatrends have also enabled various business model innovations that disrupt established industries. For example, fueled by mobile devices, social media, and cloud computing, Uber and Airbnb are examples of innovative business models based on the concept of a *sharing economy* and disrupt traditional taxi and lodging companies. Likewise, the Internet of Things and the massive amounts of data generated enable the creation of service-oriented business models (sometimes referred to *servitization*), where companies shift from selling physical products to providing these as services (see Chapter 2); for example, using sensors to monitor performance, temperature, or mileage enables tire manufacturers Bridgestone and Michelin to sell tires as a service, where truck operators pay based on usage, whereas the manufacturer is responsible for the tires' performance. Other industries being disrupted range from the financial industry to healthcare providers, where information systems allow for various radical innovations.

While these megatrends open up an almost unlimited potential for innovative products, services, or processes, they also pose a variety of challenges for organizations operating in the digital world. Throughout the book, we will discuss not only the opportunities but also the challenges organizations face when trying to harness the potential of these megatrends. What do these megatrends mean for you and for today's workforce? On a most basic level, they imply that being able to use information systems, to assess the impacts of new technologies on one's work or private life, and to learn new technologies as they come along will be increasingly important skills.

Most modern-day high school and university students have grown up in a computerized world. If by some chance they do not know how to operate a computer by the time they graduate from high school, they soon acquire computer skills because in today's work world, knowing how to use a computer—called **computer literacy** (or information literacy)—can not only open up myriad sources of information but can also mean the difference between being employed and being unemployed. In fact, some fear that the Information Age will not provide the same advantages to "information haves"—those computer-literate individuals who have almost unlimited access to information—and "information have-nots"—those with limited or no computer access or skills.

Computer-related occupations have evolved as computers have become more sophisticated and more widely used. Where once we thought of computer workers as primarily programmers, data entry clerks, systems analysts, or computer repairpersons, today many more job categories in virtually all industries, from accounting to the medical field, involve the use of computers. In

GREEN IT

The Green Internet of Things

The Internet and associated technologies have been busy disrupting business and society for the past several decades. Next up, another revolution in information technology is going to shake things up again. Green IT (or green computing, see Chapter 3) refers to the study and practice of using computing resources more efficiently to reduce environmental impacts as well as the use of information systems to reduce negative environmental impacts. The Internet of Things brings connectivity and information technology to places never before considered. Together, these technologies are once again poised to revolutionize business and society.

Traditionally, IT resources were seen as an ever-expanding pool—as business needs grew, more servers and data centers were installed. Eventually a limit has to be reached; the impact of power consumption alone from a modern data center can be profound. New technologies and techniques are having a large impact on both how we provision IT resources and how we interact with our world's resources. New servers are designed for low power consumption. Cloud computing architectures allow resources to be allocated on an as-needed basis.

With the Internet maturing into an established platform, new opportunities have become apparent. By combining ubiquitous connectivity with inexpensive processing power and sensor devices, nearly anything can be connected to the Internet. To be considered a part of the IoT, a device simply needs to be connected to the Internet, collect and transmit sensory data, and be something physical that interacts with the real world. Umbrellas notify us of the weather, smartwatches monitor our steps and vital signs, and nano-scale sensors are helping scientists collect unprecedented data about natural phenomena and ecosystems. Power companies can instrument our houses, our cars, and their distribution systems to gain unprecedented insights into energy use and demand.

Internet technologies disrupted many businesses and social processes by changing the scope and scale of interactions between people. By making large-scale interaction and communication possible almost instantaneously, supply chains could be redesigned, globalization was accelerated, and political processes were altered (for better and for worse). Individuals became citizen journalists. Together with the IoT, green technologies are enabling more accurate forecasting of resource needs and allow businesses and governments alike to become more informed and responsive. Tomorrow's leaders will need to incorporate such devices and systems into their planning to stay ahead of customer and citizen wants and needs.

Based on:

Byles, D. (2016, January 13). Technology, disruption, the Internet of Things… and you. *Businessgreen.com*. Retrieved April 24, 2016, from http://www.businessgreen.com/bg/opinion/2441499/technology-disruption-the-internet-of-things-and-you

McCabe, L. (2009, December 30). What is green IT, and why should you care? *Smallbusinesscomputing.com*. Retrieved April 24, 2016, from http://www.smallbusinesscomputing.com/testdrive/article.php/3855806/What-Is-Green-IT-and-Why-Should-You-Care.htm

fact, today there are few occupations where computers are not somehow in use. Computers manage air traffic, perform medical tests, monitor investment portfolios, control construction machinery, and more. Because they are especially adept at processing large amounts of data, they are used extensively by universities and public schools, in businesses of all sizes, and in all levels and departments of government. Engineers, architects, interior designers, and artists use special-purpose computer-aided design programs. Musicians play computerized instruments, and they write and record songs with the help of computers. Professionals in the medical industry use **healthcare IS** to support everything from patient diagnosis and treatment to analyzing patient and disease data to running doctors' offices and hospitals (see Chapter 6). Not only do we use computers at work, we also use them in our personal lives. We teach our children on them, manage our finances, do our taxes, compose letters and term papers, create greeting cards, send and receive e-mail, surf the Internet, purchase products, and play games on them. With the increasing use of computers in all areas of society, many argue that being computer literate—knowing how to use a computer and use certain applications—is not sufficient in today's world; rather, **computer fluency**—the ability to independently learn new technologies as they emerge and assess their impact on one's work and life—is what will set you apart in the future.

Information Systems Defined

An **information system (IS)** is the combination of people and information technology that create, collect, process, store, and distribute useful data. **Information technology (IT)** includes **hardware**, **software**, and **telecommunications networks**. Hardware refers to physical computer

equipment, such as a computer, tablet, or printer, as well as components like a computer monitor 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 text, the specifics on hardware, software, and telecommunications networks are discussed in Chapter 3 and the Technology Briefing. While traditionally the term *information technology* referred to the hardware, software, and networking components of an information system, the difference is shrinking, with many using the terms *IS* and *IT* synonymously. It is important to note that while many of today's technologies operate autonomously, they don't build themselves and do not exist for their own sake; rather, they are created to serve a useful purpose for people. Also, any information system involves data that are useful, for someone, somewhere. For example, transactional data are useful for businesses, status updates in your news feed on Facebook are useful for your friends as well as for Facebook itself, scores in a computer game are useful for the player as well as for the game developers, and so on. In Figure 1.12, 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, or 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*, *business information systems*, *computer information systems*, and simply *systems*. Next, we more thoroughly examine the key components of the IS definition.

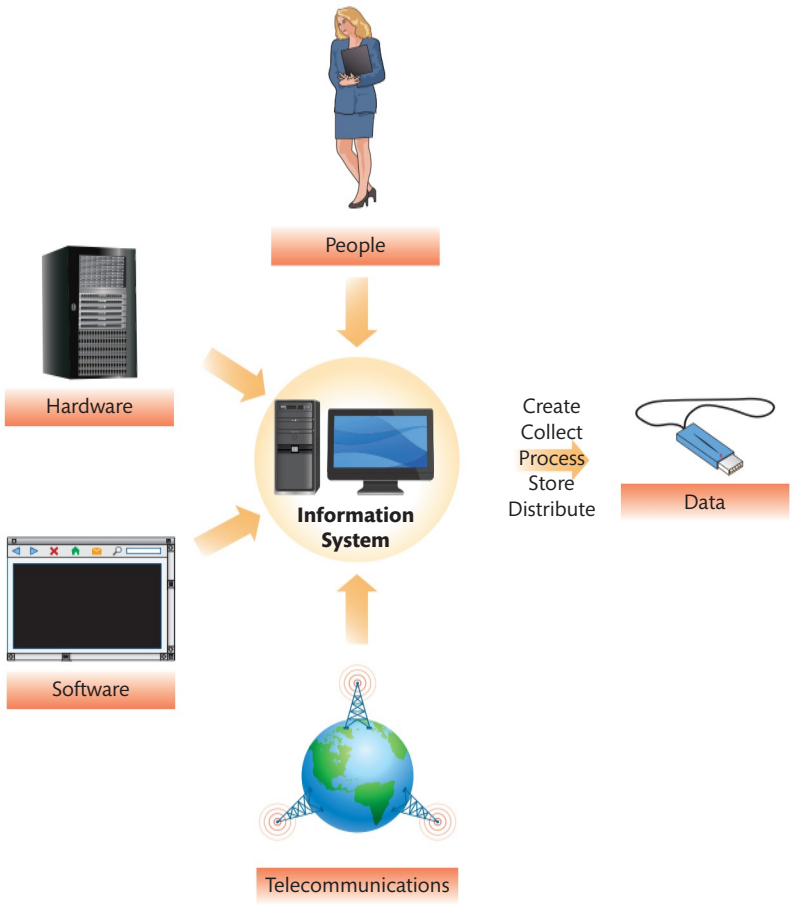


FIGURE 1.12

An information system is the combination of people and information technology that create, collect, process, store, and distribute useful data.

Data: The Root and Purpose of Information Systems

Earlier, we defined information systems as the combination of people and information technology that create, collect, process, store, and distribute useful data. We 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 raw, unformatted data, information, and knowledge. Unformatted data, or simply **data**, are raw symbols, such as characters and numbers. Data have no meaning in and of themselves and are of little value until processed (Ackoff, 1989). For example, if we asked you what 465889727 meant or stood for, you could not tell us (Figure 1.13). 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 record, in a field labeled *SSN*, you might rightly surmise that the number was actually the Social Security number of someone named John Doe. While data have no inherent meaning, the old adage "garbage in, garbage out" applies to data as well; thus, a key consideration of assessing whether data are reliable for making decisions is **data quality**, consisting of completeness, accuracy, timeliness, validity, and consistency.

INFORMATION. Data can be formatted, organized, or processed to be *useful*; they are transformed into **information**, which can be defined as a representation of reality, and can help to answer questions about who, what, where, and when (Ackoff, 1989). In the previous example, 465-88-9727 was used to represent and identify an individual person, John Doe (see Figure 1.13). Contextual cues, such as a label, are needed to turn data into information that is familiar and useful 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 transform raw data into useful information.

KNOWLEDGE. In order to actually use information, knowledge is needed. **Knowledge** is the ability to understand information, form opinions, and make decisions or predictions based on the information. For example, you must have knowledge to be aware that only one Social Security number can uniquely identify each individual (see Figure 1.13). Knowledge is a body of governing procedures, such as guidelines or rules, that are used to organize or manipulate data to make them suitable for a given task.

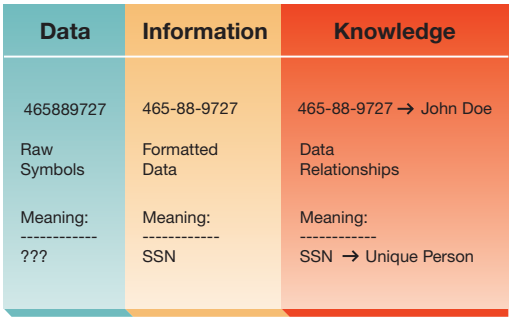
Understanding the distinctions between data, information, and knowledge is important because all are used in the study, development, and use of information systems.

Hardware, Software, and Telecommunications Networks: The Components of Information Systems

Ever since the dawn of humankind, there was a need to transform data into useful information for people, and people have invented various calculating devices, such as the abacus or the slide rule. Before the introduction of the first computers (which worked on a mechanical basis using punch cards), almost all business and government information systems consisted of file folders,

FIGURE 1.13

Data, information, and knowledge.



filing cabinets, and document repositories. Computer hardware has replaced these physical artifacts, providing the technologies to input and process data and output useful information; today, hardware includes not only "traditional" computer components but a variety of other input and output devices, including sensors, cameras, actuators, and the like. Software enables organizations to utilize the hardware to execute their business processes and competitive strategy by providing the computer hardware with instructions on what processing functions to perform. Finally, the telecommunications networks allow computers to share data and services, enabling the global collaboration, communication, and commerce we see today. The rapid evolution of the various hardware, software, and networking components make the ability to tie everything together ever more important.

People: The Builders, Managers, and Users of Information Systems

The IS field includes a vast collection of people who develop, maintain, manage, and study information systems. Yet an information system does not exist in a vacuum and is of little use if it weren't for you—the user. We will begin by discussing the IS profession and then talk about why knowing about fundamental concepts of information systems is of crucial importance in your personal and professional life.

If you are choosing a career in the IS field, you will find countless opportunities. With the growing value of data for competitive advantage, every company can now be considered a technology company, needing people with the right skill set to help optimize its business processes. The career opportunities for a person with IS training continue to be strong, and they are expected to continue to improve over the next 10 years. For example, the 2016–17 edition of the *Occupational Outlook Handbook* published by the U.S. Bureau of Labor Statistics predicted that employment for computer and IS managers will grow 15 percent through 2024, much faster than the average for all occupations (www.bls.gov/ooh/management/computer-and-information-systems-managers.htm). As more and more organizations rely more heavily on IS professionals, this boost in employment will occur in nearly every industry, not just computer hardware and software companies. *Money* magazine (http://money.cnn.com/pf/best-jobs) ranked software architect as the best job in America, with database developer and information assurance analyst also being among the top 10 best jobs in America (Table 1.1); also, *U.S. News* magazine (http://money.usnews.com/careers/best-jobs/rankings/the-100-best-jobs) rated computer systems analyst and web developer among the top 20 jobs (two of the few nonmedical jobs in that list). Likewise, a degree in information systems can provide the foundation for becoming a data scientist, currently one of the jobs with highest demand (Florentine, 2016).

In addition to an ample supply of jobs, earnings for IS professionals will remain strong. According to the U.S. Bureau of Labor Statistics, median annual earnings of these managers in May 2014 were US$127,640, with the top 10 percent earning more than US$187,200. Also, according to Salary.com, the median salary in 2016 for IT managers was US$109,701. According to a 2016 report by the National Association of Colleges and Employers, management

TABLE 1.1 Best Jobs in America (2015)

Rank	Career	Job Growth (10-year forecast)	Median Pay (in US$)
1	Software architect	23%	124,000
2	Video game designer	19%	79,900
3	Landman	13%	103,000
4	Patent agent	13%	126,000
5	Hospital administrator	23%	114,000
6	Continuous improvement manager	12%	96,600
7	Clinical nurse specialist	19%	89,300
8	Database developer	23%	88,200
9	Information assurance analyst	37%	96,400
10	Yoga instructor	13%	62,400

Source: Based on 100 Best Jobs in America, published by CNN Money, © 2016.

information systems was expected to be the highest-paid business major, with a mean starting salary of US$56,846. Likewise, information systems graduates with a master's degree had an average starting salary of US$67,632, higher than business majors such as accounting, finance, or marketing, according to a study by Temple University. Finally, computer and IS 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 (a study by Payscale.com found that IS majors were—post-graduation—among the most satisfied with their careers).

As you can see, there continues to be a very strong need for people with IS knowledge, skills, and abilities—in particular, people with advanced IS skills, as we describe here. In fact, IS careers are regularly selected as not only one of the fastest growing but also a career with far-above-average opportunities for greater personal growth, stability, and advancement. 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 who 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 IS 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.

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 information systems 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 information systems you choose to pursue—there will likely be a promising future there for you. Even if your career interests are outside information systems, being a well-informed and capable user of information technologies will greatly enhance your career prospects.

CAREERS IN INFORMATION SYSTEMS. The field of information systems includes those people in organizations who design and build systems, those who use these systems, and those responsible for managing these systems. 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. (In Table 1.2 we describe some of these careers.) 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 different companies will have different titles for the same basic function. As you can see from Table 1.2, the range of career opportunities for IS managers is broad, and salary expectations are high.

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. Many more women are in IS positions now. Also, it is now more common for an IS professional to be a polished, professional businessperson who can speak 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. 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 1.3 (see also Figure 1.14).

TABLE 1.2 Some IS Management Job Titles and Brief Job Descriptions

IS Activity	Job Title	Job Description	Salary Range, in US$, in Percentiles (25%–75%)
Develop	Systems analyst	Analyze business requirements and select information systems that meet those needs	63,000–80,000
	Software developer	Code, test, debug, and install programs	71,000–91,000
	Software architect	Create customized software for large corporations	98,000–130,000
	IT consultant	Provide IT knowledge to external clients	57,000–93,000
	Database developer	Develop, modernize, and streamline databases	57,000–68,000
Maintain	IT auditor	Audit information systems and operating procedures for compliance with internal and external standards	64,000–83,000
	Database administrator	Manage database and database management software use	75,000–99,000
	Webmaster	Manage a firm's website	59,000–80,000
Manage	IT manager	Manage existing information systems	95,000–126,000
	IS security manager	Manage security measures and disaster recovery	102,000–125,000
	Information assurance analyst	Ensure availability and security of information stored on networks and in the cloud	60,000–93,000
	E-commerce manager	Manage development, maintenance, and strategy related to e-commerce systems	97,000–126,000
	Chief information officer (CIO)	Highest-ranking IS manager; oversee strategic planning and IS use throughout the firm	213,000–316,000
	Chief digital officer (CDO)	Executive focused on converting traditional "analog" businesses to digital; oversee operations in rapidly changing digital sectors like mobile apps and social media	150,000–200,000
Study	University professor	Teach undergraduate and graduate students; study the use of information systems in organizations and society	70,000–180,000
	Government scientist	Perform research and development of information systems for homeland security, intelligence, and other related applications	60,000–200,000

Source: Based on http://www.salary.com, http://www.payscale.com.

TABLE 1.3 IS Professional Core Competencies

Domain	Description
Technical Knowledge and Skills	
Hardware	Hardware platforms, infrastructure, cloud computing, virtualization, peripherals, mobile devices
Software	Operating systems, application software, mobile apps
Networking	Network administration, cabling and network interface cards, wireless, Internet, security
Business Knowledge and Skills	
Business integration, industry	Business processes, functional areas of businesses 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, choice

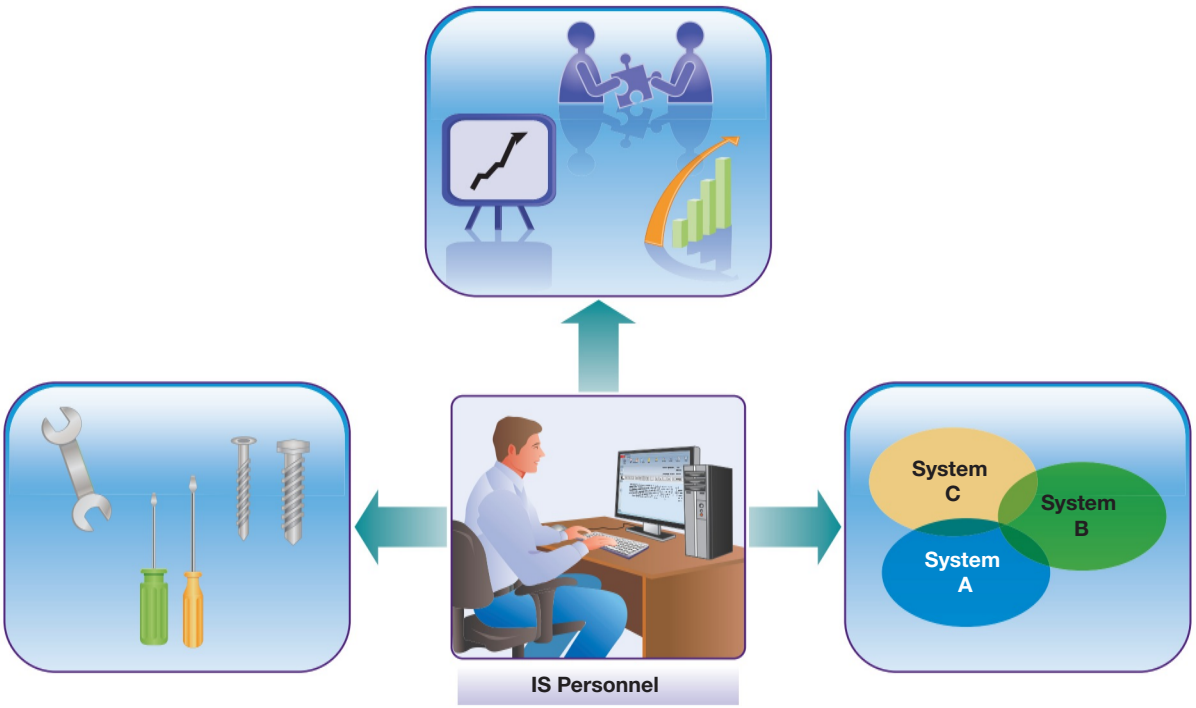


FIGURE 1.14

Good IS personnel possess valuable, integrated knowledge and skills in three areas—technical, business, and systems.

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 information systems. This is not to say that the IS professional must be a technical expert in these areas. On the contrary, the IS professional must know just enough about these areas to understand how they work, what they can do for an organization, 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 of the rapid pace of technological innovation in the digital world. With the economy rebounding, organizations are starting new projects or are reviving projects put on hold during the economic downturn; hence, while it once appeared as if most programming jobs or support jobs would be outsourced to third-party providers abroad, there is an increased demand in many companies for people with application development skills, especially in combination with sound business analysis and project management skills (Brandel, 2013). In fact, many of the hot skills listed in Table 1.4 are focused on the business domain, which is discussed next.

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 some low-level technology jobs may be outsourced, the Bureau of Labor Statistics recently reported that there is an increased need for IS managers as organizations embrace mobility and cloud computing (www.bls.gov/ooh/management/computer-and-information-systems-managers.htm). As a result, it is absolutely vital for IS professionals to understand the technical areas *and* the nature of the business. 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.

TABLE 1.4 Hot Skills for the Next Decade

Domain	Hot Skills
Business	Business–IT alignment; business analysis; enterprise solutions; business process modeling; project management; third-party provider management; enterprise-oriented social media
Technology infrastructure and services	Virtualization; cloud computing/infrastructure as a service; cloud integration; serverless computing; systems analysis and design; network design; systems auditing; wireless; telecommunications/VoIP (Voice over Internet Protocol); database administration; data centers
Security	IT security planning and management; BYOD; governance, risk, and compliance; cybersecurity
Applications	Customer-facing application development; mobile app development; web development; open source; portal technologies; cloud computing; user experience; legacy systems integration; interface design; content management systems
Internet	Social media; customer-facing web applications; mobile apps; search engine optimization; artificial intelligence; web mining; Internet of Things
Business analytics/ data science	Business intelligence; advanced analytics; data warehousing; data mining; unstructured data analysis; Big Data

Source: Based on Broom (2016), Florentine (2015), Pratt (2015), Leung (2009).

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. Unfortunately, given the increased sophistication of modern information systems, organizations can often have a difficult time finding qualified personnel, and attracting the right people with the right skills is not possible in some areas. Consequently, many technology-focused organizations tend to cluster in areas where talented workers are available. 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 IT sector within the United States are headquartered in Silicon Valley, California; Boston, Massachusetts; Austin, Texas; or Seattle, Washington. 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, more than 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. In other areas, organizations may have to find creative ways to attract and retain people, such as by offering favorable benefits packages that include educational grants or expense-matching programs to encourage employees to improve their education and skills. Other human resource policies, such as telecommuting, flextime, and creative benefit packages, can also help to attract and retain the best employees.

YOU—THE USER. Clearly, the field of information systems offers a wide variety of interesting career choices, and you will likely find a career that offers a host of opportunities for lifelong learning and advancement. Yet understanding fundamental concepts related to information systems will be critical in almost any career as well as in your private life. In almost any

SECURITY MATTERS

Ransomware

As more and more of our business and professional lives are lived online, the security of our personal and business data has become increasingly important. In recent years, attackers have gotten more sophisticated and have shifted tactics. A new tactic is the distribution of ransomware, a novel approach to extracting money from victims. Ransomware refers to a type of virus that, once it has infected a victim's system or network, encrypts the data it finds in place in a format that renders them impossible for the victim to access. The attacker then demands a ransom payment in return for releasing the decryption keys that can be used to access and recover the data (though many victims have painfully experienced that paying the ransom does not guarantee regaining access to the data). Victims range from individuals, who may stand to lose years of family photos or personal records, to businesses large and small, who may lose customer records, financial data, intellectual property, or other valuable data. The malicious software usually arrives as an attachment to a spam e-mail or is downloaded in the guise of a video or other content from a website.

Until recently, attackers have largely focused on individuals and small businesses and demanded relatively small ransoms that are affordable enough that the victim will seriously consider paying the ransom. The average payment demanded in 2015 was just US$300 according to security firm Symantec. By early 2016, however, there has been an apparent shift to larger, higher-value organizations. Hollywood Presbyterian Medical Center in Los Angeles was forced to pay a US$17,000 ransom after its network was broadly infected with ransomware. Another hospital in Ottawa decided not to pay the ransom demanded of it and was able to restore data from backups. Security researchers warn that attackers are increasingly not just attempting to lock down the data but are threatening to release the data to the public if not paid. For organizations dealing with sensitive or personally identifiable information, lawsuits and reporting requirements can make such public release an even more costly threat than simply losing access to their data.

With threats like ransomware becoming increasingly prevalent, individuals and organizations will need to increase their security awareness and vigilance to better avoid potential infections and also improve their backup and disaster recovery preparations in order to become more resilient to such attacks.

Based on:

Colwey, S., & Stack, L. (2016, February 18). Los Angeles hospital pays hackers $17,000 after attack. *The New York Times*. Retrieved April 14, 2016, from http://www.nytimes.com/2016/02/19/business/los-angeles-hospital-pays-hackers-17000-after-attack.html

Pilieci, V. (2016, March 16). Ottawa Hospital hit with ransomware, information on four computers locked down. *Ottawa Citizen*. Retrieved April 14, 2016, from http://ottawacitizen.com/news/local-news/ottawa-hospital-hit-with-ransomware-information-on-four-computers-locked-down

Savage, K., Coogan, P., & Lau, H. (2015, August 6). The evolution of ransomware. *Symantec.com*. Retrieved April 14, 2016, from http://www.symantec.com/content/en/us/enterprise/media/security_response/whitepapers/the-evolution-of-ransomware.pdf

business-related field, you will be extensively using information systems, and you will likely be involved in various information systems–related decisions within your organization. Understanding what information systems are capable of doing (as well as what they cannot do), being able to communicate with the "techies," and being able to make educated IS-related decisions are likely to set you apart from your competition. Especially in smaller organizations (that may not have dedicated IS departments), you are likely to be involved in IS-related investment decisions, and lacking a basic understanding of fundamental issues associated with topics such as IS infrastructure, systems analysis and design, or information systems security will put you at the mercy of outside consultants or (worse yet) vendors who are likely to act out of their own interests, often trying to sell you their "technology of the week/month/year."

In addition, as you have undoubtedly noticed, you are facing a number of IS-related decisions in your private life. Examples of such decisions abound; for example, you may face the question of what mobile phone to purchase next: an iPhone, a phone using some version of the Android operating system, or a phone sporting Microsoft's Windows 10 Mobile operating system. Such decisions are likely to include your own preferences or influence by your peers, but there are a number of critical differences in terms of privacy, security, available apps, and the like. Likewise, you may face the problem of how to best secure your wireless network at home or may wonder how to best keep your various files in sync across different computers or mobile devices.

Finally, you may have a great idea for a new product or service and want to launch a startup. Having the idea is but the first step, and you will soon realize the role of information systems in

all phases of the process of bringing your idea to the market. Thus, understanding how information systems can fuel the development and commercialization of your idea is crucial. Throughout this text, we will touch on those issues and hope that you will gain valuable knowledge to understand the trade-offs involved when selecting new information systems.

Organizations: The Context of Information Systems

We have talked about data versus information, the technology side of information systems, and the people side of information systems. Information systems do not exist in a vacuum; they are built and/or used within a certain context. Organizations use information systems to become more productive and profitable, to gain competitive advantage, to reach more customers, or to improve customer service. This holds true for all types of organizations—professional, social, religious, educational, and governmental—and for all types of industries—medical, legal, manufacturing, and so on. In fact, the U.S. Internal Revenue Service launched its own website for the reasons just described (Figure 1.15). The website was so popular that approximately 220,000 users visited it during the first 24 hours and more than 1 million visited it in its first week—even before the web address for the site was officially announced. Today, popular websites like Facebook.com and WSJ.com receive millions of visitors every day.

TYPES OF INFORMATION SYSTEMS. Throughout this text, we explore various types of information systems commonly used in organizations. It makes sense, however, for us to describe briefly a few of 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 1.5 provides a list of the major categories 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. For example, not only are **transaction processing systems (TPS)** used by a broad range of organizations to process customer transactions more efficiently, these systems also generate a tremendous amount of data that can be used by the organization to learn about customers or ever-changing product trends. Your local grocery store uses a TPS at the checkout that scans bar codes on products; as this occurs, many stores will print discount coupons on the backs of receipts for products related to current purchases. Every hour, online retailer Amazon.com's website processes thousands of transactions from around the world. This massive amount of data is fed into large data warehouses and is then analyzed to provide purchase recommendations to future customers. In addition, TPS data are sorted and organized to support a broad range of managerial decision making using a variety of systems; the most common of these is generally referred to as **management information systems**. TPS data also provide input into a variety of other information systems within organizations, including *decision*

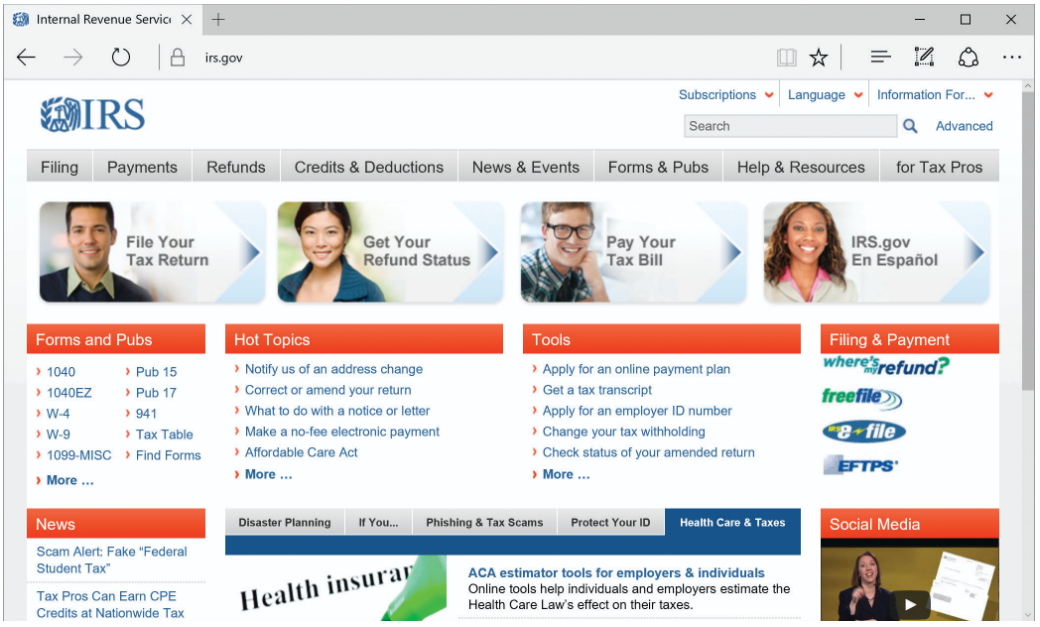


FIGURE 1.15

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

Source: Courtesy of the United States Department of the Treasury.

TABLE 1.5 Categories of Information Systems Used in Organizations

Category of System	Purpose	Sample Application(s)
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, student registration system
Management information system	Produce detailed information to help manage a firm or part of a firm	Inventory management and planning system, student enrollment management
Decision support system	Provide analysis tools and access to databases in order to support quantitative decision making	Product demand forecasting system, loan and investment analysis
Intelligent system	Emulate or enhance human capabilities	Automated system for analyzing bank loan applications, self-driving car
Business intelligence system	Analyze Big Data to better understand various aspects of a business	Online analytical processing (OLAP) system
Office automation system (personal productivity software)	Support a wide range of predefined day-to-day work activities of individuals and small groups	Word processor, spreadsheet, presentation software, e-mail client
Collaboration system	Enable people to communicate, collaborate, and coordinate with each other	E-mail system with automated, shared calendar
Knowledge management system	Enable the generation, storage, sharing, and management of knowledge assets	Knowledge portal for finding answers to common questions
Social software	Facilitate collaboration and knowledge sharing	Social network, connecting colleagues and friends
Geographic information system	Create, store, analyze, and manage geographically referenced data	Site selection for new shopping mall
Functional area information system	Support the activities within a specific functional area of the firm	Planning system for personnel training and work assignments
Customer relationship management system	Support interaction between the firm and its customers	Sales force automation, lead generation
Enterprise resource planning 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 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 website	Amazon.com, eBay.com, Nordstrom.com
Mobile app	Perform a particular, well-defined function, typically on a mobile device	Instagram, Snapchat, WhatsApp, Facebook app

support systems, intelligent systems, business intelligence systems, knowledge management systems, social software, geographic information systems, and *functional area information systems*. Five to 10 years ago, it would have been typical to see systems that fell cleanly into one of these categories. Today, many organizations have replaced standalone systems with *enterprise systems* that span the entire organization. Likewise, 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). In addition, many of these systems are not housed within organizations anymore but are located "in the cloud" and accessed via the users' browsers when needed. 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 data from diverse sources and present them to busy decision makers along with tools to manipulate and 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 such as Microsoft Office and the OpenOffice.org Productivity Suite provide word processing, spreadsheet, and other personal productivity tools, enabling knowledge workers to accomplish their tasks; *collaboration systems*, such as Microsoft's Exchange/Outlook, Lotus Notes, or Google Apps, provide people with e-mail, automated calendaring, and online, threaded discussions, enabling close collaboration with others, regardless of their location.

Systems for *electronic commerce* (or *e-commerce*), such as corporate websites, are also popular and important. These systems 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 data. In Chapter 4, "Enabling Business-to-Consumer Electronic Commerce," we talk about different forms of electronic commerce involving the end consumer; in Chapter 8, "Strengthening Business-to-Business Relationships via Supply Chain and Customer Relationship Management," we discuss how organizations use the Internet to enable or facilitate business-to-business transactions.

While many modern-day information systems span several of these IS categories or integrate different types of systems, 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 information systems, 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 IS FUNCTION. Old-school IS personnel believed that 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; in addition, 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. The increasing pervasiveness of technology in businesses and societies has led to a shifting mindset about information systems within organizations. Increasingly fast-paced competition is forcing businesses to regard IS as an enabler for streamlining business processes, providing better customer service, and better connecting and collaborating with various stakeholders inside and outside the organization. Many organizations, for example, have realized that some of the best ideas for solving business problems come from the employees using the system; as a result, personnel within many IS units have taken on more of a consulting relationship with their users, helping the users solve problems, implement ideas, and be more productive. IS personnel are increasingly reaching out to their internal 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 customers' 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 PC—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 both to the central IS group and to 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 to coordinate technology and related decisions 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

WHEN THINGS GO WRONG

Technology Addiction

In 2015, the average person in the United Kingdom spent 9 hours and 53 minutes consuming media each day, 50 percent of 18- to 24-year-olds checked their phone within 5 minutes of waking up, and a third of 25- to 34-year-olds visited social media sites or used mobile apps more than 10 times a day. Between the near-ubiquitous availability of network connectivity and the sheer number of options when it comes to ways to interact online, we are increasingly distracted by information technology, to the point where some doctors argue that we are actually becoming addicted. Dopamine—the brain chemical associated with pleasure—is released when we are stimulated, whether by food, sex, excitement, or interacting online. The hit of dopamine we get when we get a "like," update our status, or read the latest tidbit of news or gossip can have the same addicting effect on our bodies as drugs like cocaine or heroin. In addition, being plugged in all the time reduces the brain's ability to let us relax. Hyper-stimulation from having a screen in front of us from when we wake up to when we finally fall asleep causes a type of hyper-arousal—we walk around in a constant state of distraction.

As we find more and more uses for technology in our daily lives, the threat of technology addiction is getting worse. Cognitive psychologist and neuroscientist Daniel J. Levitin claims that, on average, we are taking in information equivalent to the content of 175 newspapers every day—five times more than we did 30 years ago. Children are affected as well. Too much screen time can affect memory and lead to a decline in grades—the part of the brain that helps us focus may not develop properly. A study carried out in Canada in 2015 by Microsoft revealed that the average human attention span has fallen from 12 seconds at the turn of this century to a mere 8 seconds—less than that of a goldfish. However, there may be a bright side. Because the younger generations have been immersed in the technology their entire lives, they may be better able to adjust and adapt—they may develop a better feel for their limits and how to avoid exceeding them.

So what can we do to improve the situation? Start by turning off the gadgets for a while each day. Improving your overall health helps as well—eat right, stay hydrated, and work out regularly. Finally, get enough sleep and don't fall asleep to Netflix or Facebook.

Based on:

Foot, G. (2016). Why can't I concentrate? *BBC*. Retrieved April 24, 2016, from http://www.bbc.co.uk/guides/zshv9qt

Kleinman, Z. (2015, August 31). Are we addicted to technology? *BBC News*. Retrieved April 24, 2016, from http://www.bbc.com/news/technology-33976695

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 understand both the technology side *and* the business side of the organization. This is becoming increasingly important due to ever-faster IT cycles: Where traditionally, IS departments thought in time frames of about 5 years, nowadays, new devices (such as new versions of Apple's iPad) come out every 6–18 months, and organizations wanting to harness the opportunities brought about by new devices have to adjust to this change in pace.

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: Outages Outrage Gamers

Computer gaming has increasingly become interactive, with more and more games offering multiplayer experiences. Riding on the bandwagon, Sony introduced the PlayStation Network in 2006 to accompany its successful PlayStation game consoles. In 2010, Sony added a service named PlayStation Plus, offering subscription-based premium services. In the war of the game consoles, PlayStation Plus was regarded as a way for Sony to get ahead of the competition from Microsoft's Xbox and Nintendo's Wii. However, since its inception, the PlayStation Network has been plagued with all-too-frequent system outages. Most notably, in 2011, a system outage following a malicious attack lasted 23 days. On Christmas Day 2014, a denial-of-service attack (see Chapter 10, "Securing Information Systems") caused the PlayStation Network to be unavailable, ruining the holidays for many users (Figure 1.16). In 2016, the first outage happened only a few days into the new year, with further outages following just a few weeks later. Built to help achieve competitive advantage, the PlayStation Network continues to be Sony's Achilles heel.

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, a US$47.5 billion family of companies (2016 data), is the world's largest express transportation company, delivering millions of packages and millions of pounds of freight to 220 countries and territories each business day. FedEx uses extensive,

FIGURE 1.16

System outages annoy online gamers.

Source: phoenix21/Fotolia.

interconnected information systems to coordinate more than 340,000 employees, hundreds of aircraft, and more than 100,000 ground vehicles worldwide. To improve its services and sustain a competitive advantage, FedEx continuously updates and fine-tunes its systems. For example, FedEx.com has more than 50 million unique visitors per month and more than 50 million tracking requests per day, and FedEx strives to provide the most accurate tracking information to each visitor. Similarly, in FedEx's ground hubs, automation is another enabler of competitive advantage. En route to its destination, each package typically travels through at least one sorting facility, where it is routed to its intermediate and final destinations (Figure 1.17). Traveling through an extensive network of conveyor belts, each package is scanned multiple times and can be rerouted as needed. Once a package passes an overhead scanner, there is between 1 and 2 seconds of time to divert a package, so decisions have to be made in a few hundred milliseconds (King, 2011). On average, FedEx reengineers and improves the performance twice a year and now manages to deliver a quarter of all daily packages handled within 1 business day. These and other information systems have positioned FedEx as the global leader in express transportation.

Information Systems for Competitive Advantage

The PlayStation Network and FedEx systems are typical of systems that are pervasive in today's life or 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 organizations that built them. The choices made in developing the systems at Sony and FedEx were **strategic** in their intent. Both Sony's PlayStation Network and FedEx's systems were developed and are continuously updated to help the companies gain or sustain some **competitive advantage** (Porter, 1985; Porter & 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 a powerful enabler of competitive advantage.

Although we described the use of information systems at two very 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.

Some argue that as information systems have become standardized and ubiquitous, they are now more of a commodity that is absolutely necessary for every company, and companies should focus information technology strictly on cost reduction and risk mitigation and that investing in information technology for differentiation or for competitive advantage is futile. Yet, as evidenced by the advances in smartphones, the emergence of social networks, or changes in various creative industries, IT is changing rapidly, and many companies have gained competitive advantage by innovatively using the potential of new technologies. Specifically, companies from

FIGURE 1.17

Packages travel through an extensive network of conveyor belts, where they are routed to their intermediate and final destinations.
Source: Steve Design/Shutterstock.

Amazon.com to Zappos created competitive advantage by combining certain commoditized technologies with proprietary systems and business processes. Companies with bad business models tend to fail regardless of whether they use information technology, but companies that have good business models and use information technology successfully to carry out those business models tend to be very successful. For companies such as Google or Facebook, data generated by the customers create value, and how data are being gathered, processed, and used can be a source of sustained competitive advantage (Vellante, 2011); other companies, such as Amazon.com, use their IT expertise to sell cloud computing services to other businesses, directly generating revenue from their IT investments.

In sum, we believe that information systems are a necessary part of doing business and that they can be used to create efficiencies but that they can also be used as an enabler of competitive advantage. Organizations should also note, however, that the competitive advantage from the use of information systems can be fleeting, as competitors can eventually do the same thing.

ETHICAL DILEMMA

The Social and Environmental Costs of the Newest Gadgets

We all face ethical dilemmas. Such situations, sometimes called moral dilemmas, occur when one has to choose between two different options, each of which involves breaking a moral imperative. Throughout this book, we will present situations that involve ethical dilemmas for the players involved. For most (if not all) of these situations, there are no definite solutions. In trying to resolve ethical dilemmas, decision makers should take into consideration both the consequences of and the actions involved in each approach: First, consider the *consequences* of each potential course of action, in terms of benefits and harms (considering degree and time horizon), so as to identify the option that maximizes benefits while minimizing harms. The second step is to consider the *actions* involved (irrespective of the consequences) and to evaluate which actions are least problematic from a moral standpoint (in terms of honesty, fairness, respect, and so on). While you may not arrive at a perfect solution, taking these two factors into account should give you some guidance on how to arrive at a decision.

There are various ethical dilemmas surrounding the production, use, and disposal of electronic devices, and Apple is no exception. For example, tiny silver letters printed on the back of an iPhone say: "Designed by Apple in California—Assembled in China." Globalization has enabled Apple to focus on designing electronics consumers crave while outsourcing the manufacturing of components and assembling of the devices to contract manufacturers on a global scale. However, while Apple keeps tight control over the designs of its devices, it does not always have complete control over *how* its suppliers build the devices.

As a case in point, Foxconn, one of Apple's primary Chinese assembly partners, was recently scrutinized following a series of complaints of poor working conditions. The pressures of huge production volumes and tight deadlines resulted in pushing workers to their limit, causing twitching hands, uncontrollable mimicking of the motion after work, a rapid burnout rate, the resignation of 50,000 workers each month, and even up to 14 suicides. An independent audit at various factories confirmed that laborers worked excessive overtime and faced health and safety issues. In addition to labor, rare earth minerals are crucial for manufacturing electronic devices. Used for everything from magnets to superconductors, many of today's high-tech products would not exist without rare earths. However, the mining of these minerals, primarily done in China, poses an enormous threat to the environment as well as to the health of the mining workers.

As the leaders of other technology companies, Apple's CEO Tim Cook faces a number of dilemmas. For its shareholders, Apple pursues a goal of profit maximization. In pursuing this goal, Apple introduces gadgets consumers crave at an ever-increasing pace, creating a hype around each new device, which, in turn, creates huge demand. There are few suppliers worldwide who can, on relatively short notice, produce the numbers needed to meet the demand for Apple's products, so shifting suppliers is not easy for Apple. At the same time, reducing working hours, raising salaries, or offering other fringe benefits negatively affects Apple's profit margin. Further, for many young Chinese, working at Foxconn for a few months is better than the alternative of tilling the fields on their families' small farming operations or not working at all, as evidenced by the thousands of workers lining up for Foxconn's recruiting sessions every week.

Questions

1. If you were in Tim Cook's shoes, what would you do?
2. As a consumer, what are your ethical dilemmas associated with the ever-increasing desire for new gadgets?

Based on:

Anonymous. (2012, March 29). Apple addresses China Foxconn factory report. *BBC News*. Retrieved March 21, 2016, from http://www.bbc.com/news/technology-17557630

Kaiman, J. (2014, March 20). Rare earth mining in China: the bleak social and environmental costs. *The Guardian*. Retrieved March 21, 2016, from http://www.theguardian.com/sustainable-business/rare-earth-mining-china-social-environmental-costs

IS Ethics

A broad range of ethical issues have emerged through the use and proliferation of computers. Especially with the rise of companies such as Google, which generate tremendous profits by collecting, analyzing, and using their customers' data, and the emergence of social networks such as Facebook, many people fear negative impacts such as social decay, increased consumerism, or loss of privacy. **Computer ethics** is used to describe moral issues and standards of conduct as they pertain to the use of information systems. In 1986, Richard O. Mason wrote a classic and very insightful article on the issues central to this debate—information privacy, accuracy, property, and accessibility (aka "PAPA"). These issues focus on what information an individual should have to reveal to others in the workplace or through online transactions, ensuring the authenticity and fidelity of information, who owns information about individuals and how that information can be sold and exchanged, and what information a person or organization has the right to obtain about others and how this information can be accessed and used.

With the societal changes brought about by information systems, the issues surrounding privacy have moved to the forefront of public concern; in addition, the ease of digitally duplicating and sharing information has raised not only privacy concerns but also issues related to intellectual property. Next, we examine these issues.

Information Privacy

If you use the Internet regularly, sending e-mail messages, posting status updates on Facebook, or just visiting websites, you may have felt that your personal privacy is at risk. Several e-commerce websites where you like to shop greet you by name and seem to know which products you are most likely to buy (Figure 1.18); other websites provide you with advertising that appears to be targeted accurately at you. As a result, you may feel as though eyes are on you every time you go online. **Information privacy** is concerned with what information an individual should have to reveal to others in the workplace or through other transactions, such as online shopping.

Although the Information Age has brought widespread access to information, the downside is that others may now have access to personal information that you would prefer to keep private. Personal information, such as Social Security numbers, credit card numbers, medical histories, and even family histories, is now available on the Internet. Using search engines,

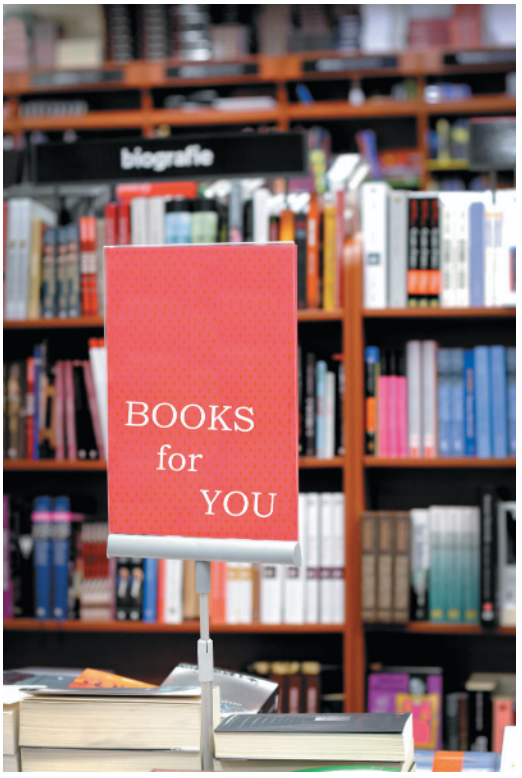


FIGURE 1.18

Just like the owners of your neighborhood bookstore, online merchants such as Amazon.com greet you by name and personalize their websites to individual customers.

Source: Jurgita Genyte/Shutterstock.

your friends, coworkers, spouse, or even current or future employers can find out almost anything that has been posted by or about you on the Internet. For example, it is very easy to locate your personal blog, your most recent party pictures posted on Facebook, or even sensitive questions you asked in a public discussion forum about drug use or mental health. Moreover, many of these pages are stored in the search engines' long-term cache, so they remain accessible for a long time even after they have been taken off the web. Yet some countries are seeking to protect their citizens from this. In 2014, the European Court of Justice ruled that individuals have the "right to be forgotten" and that search engines may have to remove links with personal information if the "information is inaccurate, inadequate, irrelevant or excessive for the purposes of the data processing" (European Commission, n.d.). This ruling, however, creates yet another set of ethical issues, this time centering around censorship of web content. In order to uphold freedom of expression and freedom of the media, such requests are handled on a case-by-case basis.

INFORMATION PROPERTY ON THE WEB. It happens to all of us. Nearly every day in our physical or virtual mailboxes, we receive unwanted solicitations from credit card companies, department stores, magazines, or charitable organizations. Many of these items are never opened. We ask the same question over and over again: "How did I get on another mailing list?" Our names, addresses, and other personal data were most likely sold from one company to another for use in mass mailings.

Who owns the computerized data about people—the data that are stored in thousands of databases by retailers, credit card companies, and marketing research companies? The answer is the company that maintains the database of customers or subscribers legally owns the data and is free to sell them. Your name, address, and other data are all legally kept in a company database to be used for the company's future mailings and solicitations, and the company can sell its customer list or parts of it to other companies who want to send similar mailings.

There are limits, however, to what a company can do with such data. For example, if a company stated at one time that its collection of marketing data was to be used strictly internally as a gauge of its own customer base and then sold those data to a second company years later, it would be unethically and illegally breaking its original promise. Companies collect data from credit card purchases (by using a credit card, you indirectly allow this) or from surveys and questionnaires you fill out when applying for a card. They also collect data when you fill in a survey at a bar, restaurant, supermarket, or the mall about the quality of the service or product preferences. By providing these data, you implicitly agree that the data can be used as the company wishes (within legal limits, of course).

What is even more problematic is the combination of survey data with transaction data from your credit card purchases. As information systems are becoming more powerful, it becomes easier to collect and analyze various types of data about people. For example, using demographic data (Who am I, and where do I live?) and psychographic data (What do I like, what are my tastes and preferences?), companies can piece together bits of data about people, creating highly accurate profiles of their customers or users, with each additional bit helping to create a more accurate picture. Such pictures, sometimes referred to as "the Database of Intentions" (Battelle, 2010), can contain information about what people want, purchase, like, are interested in, or are doing; where they are; who they are; and whom they know (Figure 1.19).

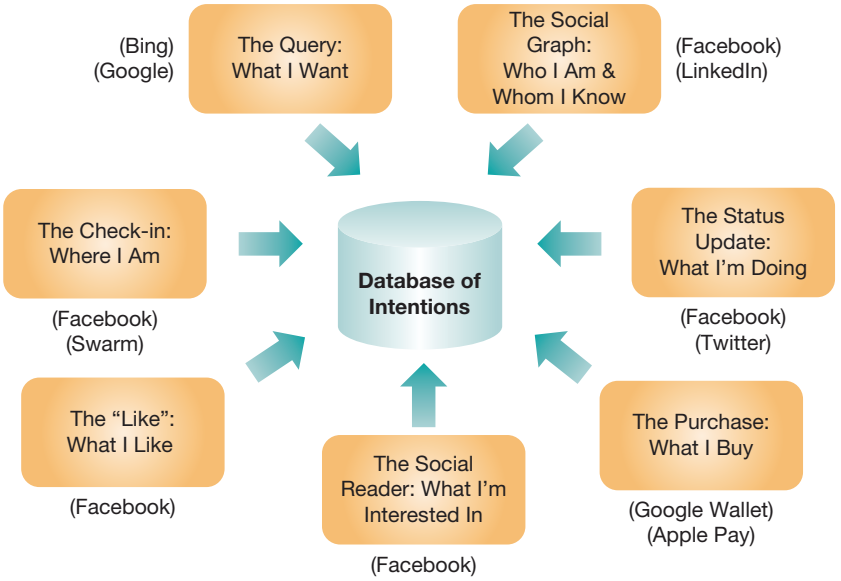
Needless to say, just because people provide data at different points does not mean that they agree for the data to be combined to create a holistic picture. Companies are often walking a fine line, as data about customers are becoming increasingly valuable. Especially in the age of Big Data analytics, there are various concerns, for example, related to discrimination or the selling of personal data but also related to embarrassments resulting from data breaches. Further, advanced analytics of vast amounts of structured and unstructured data about people's behavior enables building predictive models pertaining to people's behavior. Ultimately, this allows manipulating people (e.g., by targeted advertising) and essentially reduces human beings to objects that can be quantified and manipulated and whose value is primarily of commercial nature.

How do you know who is accessing these databases? This is an issue that each company must address at both a strategic/ethical level (Is this something that we should be doing?) and a tactical level (If we do this, what can we do to ensure the security and integrity of the data?). The company needs to ensure proper hiring, training, and supervision of employees who have access to the data and implement the necessary software and hardware security safeguards.

FIGURE 1.19

The database of intentions.

Source: Based on *The Database of Intentions is Far Larger than/Thought* by John Battelle, published by John Battelle.



In today's interconnected world, there are even more dangers to information privacy. Although more and more people are concerned about their privacy settings on social networks such as Facebook, there are things that you may not be able to control. For example, if one of your friends (or even a stranger) posts a photo of you on Facebook, it will be there for many others to view, whether you like it or not. By the time you realize it, most of your friends, coworkers, and family members may have already seen it. At other times, you may divulge sensitive data (such as your address or date of birth) when signing up for yet another social network; as newer, more exciting applications come up, you abandon your profile, but your data stay out there. Sometimes, you may forget who's following your activities at the various social networking sites, and you may tell people things you never wanted them to know. As these examples show, there are many more threats to your privacy than you may have thought.

E-MAIL PRIVACY. The use of e-mail raises further privacy issues, as nowadays, almost everyone sends and receives electronic mail. Although it is slowly being supplanted by social networking services and text messages, e-mail is still one of the most popular software applications of all time, having contributed greatly to a steady decline of physical mail. However, recent court cases have not supported computer privacy for employee e-mail transmissions and Internet usage. For example, most companies provide employees with access to the Internet and e-mail systems, and many periodically monitor the e-mail messages that employees send and receive. Monitoring employee behavior is nothing new, and for many businesses it was a natural extension to monitor employee e-mail messages.

Surprisingly, there is little legal recourse for those who support e-mail privacy. In 1986, the U.S. Congress passed the Electronic Communications Privacy Act (ECPA), but it offered far stronger support for voice mail than it did for e-mail communications. This act made it much more difficult for anyone (including the government) to eavesdrop on phone conversations. E-mail privacy is, however, much less protected. In addition, no other laws at the federal or state levels protect e-mail privacy. However, some states, most notably California, have passed laws that define how companies should inform their employees of the monitoring and in which situations monitoring is legal. Even so, this law is more of a guideline for ethical practice than a protection of privacy (Sipior & Ward, 1995).

Fortunately, the ECPA and the court case judgments thus far on e-mail monitoring suggest that companies must be prudent and open about their monitoring of e-mail messages and Internet usage. Companies should use good judgment in monitoring e-mail and should make public their policy about e-mail monitoring. One primary reason that employees perceive their e-mail to be private is the fact that they are never told otherwise (Weisband & Reinig, 1995). In addition, employees should use e-mail only as appropriate, based on their company's policy and their own ethical standards. Given recent actions and rulings on the capture and usage of e-mail messages,

it appears that online privacy is in jeopardy both in and out of business organizations. As a general rule, we all need to realize that what we type and send via e-mail in and out of the workplace is likely to be read by others for whom the messages were not intended. It is wise to write only those e-mail messages that would not embarrass us if they were made public.

HOW TO MAINTAIN YOUR PRIVACY ONLINE. In general, companies operating in the online world are not required by law to respect your privacy. In other words, a vendor can track what pages you look at, what products you examine in detail, which products you choose to buy, what method of payment you choose to use, and where you have the product delivered. After collecting all those data, unscrupulous vendors can sell them to others, resulting in more direct-mail advertising, electronic spam in your e-mail inbox, or calls from telemarketers.

When surveyed about concerns related to Internet use, most consumers list issues of information privacy as a top concern. As a result, governments have pressured businesses to post their privacy policies on their websites. As outlined in the U.S. Federal Trade Commission's "Fair Information Practice Principles" (www.ftc.gov/reports/privacy3/fairinfo.shtm, see also Figure 1.20), widely accepted fair information practices include:

- ***Notice/Awareness.*** Providing information about what data are gathered, what the data are used for, who will have access to the data, whether provision of the data is required or voluntary, and how confidentiality will be ensured. Such information is typically contained in **data privacy statements** on a website.
- ***Choice/Consent.*** Providing options about what will be done with the data (e.g., subscription to mailing lists after a purchase). Typically, consumers are given a choice to **opt in** (i.e., signal agreement to the collection/further use of the data, e.g., by checking a box) or **opt out** (i.e., signal that data cannot be collected/used in other ways).
- ***Access/Participation.*** Providing customers with means to access data collected about them, check for accuracy, and request correction of inaccuracies.
- ***Integrity/Security.*** Ensuring integrity of the data (e.g., by using only reputable sources of data) as well as implementing controls against unauthorized access, disclosure, or destruction of data (we will discuss these controls in Chapter 10, "Securing Information Systems").
- ***Enforcement/Redress.*** Providing means to enforce these practices, and/or for customers to receive remedies, for example, through self-regulation or appropriate laws and regulations.

Unfortunately, while data privacy statements provide information about, for example, how data will be used, they often do not *protect* the privacy of consumers. To protect yourself, you should always review the privacy policy of all companies you do business with and refuse to do business with those that do not have a clear policy or do not respect your privacy. To make sure

FIGURE 1.20

Fair Information Practice Principles.

Source: Courtesy of the Federal Trade Commission.

your shopping experience is a good one, you can take a few additional steps to maintain your privacy:

- ***Choose Websites That Are Monitored by Independent Organizations.*** Several independent organizations monitor the privacy and business practices of websites (e.g., www.truste.com).
- ***Avoid Having "Cookies" Left on Your Machine.*** Many commercial websites leave cookies on your machine so that the owner of the site can monitor where you go and what you do on the site. To protect your privacy, you should carefully manage your browser's cookie settings or get special "cookie management" software (see Chapter 10 for more on cookies).
- ***Visit Sites Anonymously.*** There are ways to visit websites anonymously. Using services provided by companies such as Anonymizer (www.anonymizer.com), you have a high degree of privacy from marketers, identity thieves, or even coworkers when surfing the web.
- ***Use Caution When Requesting Confirmation E-Mail.*** When you buy products online, many companies will send you a confirming e-mail message to let you know that the order was received or the item has been shipped. A good strategy is to use a separate e-mail account, such as one that is separate from your work e-mail, when making online purchases.
- ***Beware What You Post or Say Online.*** As an old adage goes, "the Internet never forgets"; anything from status updates to Twitter messages to blog posts can be stored forever, and most content remains somewhere on the web, even after the original page has long been taken down. It is safe to say that probably almost everybody engages in some regrettable activities at some point in time. Yet having such activities appear on the web can be devastating for one's career, so use common sense before you post that drunken party pic on Facebook or tweet that you are so bored on your job.

Of course, there are no guarantees that all your online experiences will be problem free, but if you follow the advice provided here, you are much more likely to maintain your privacy.

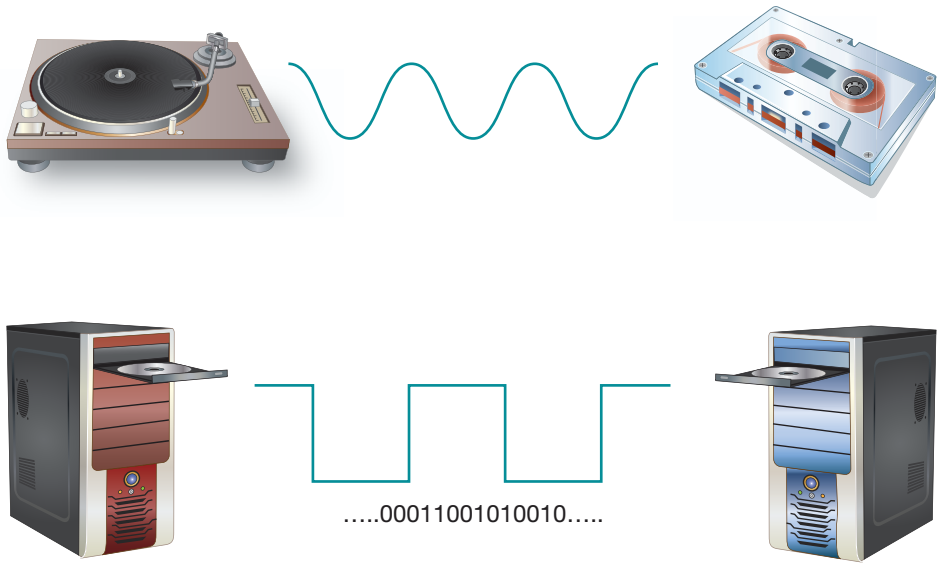
Intellectual Property

Another set of ethical issues centers around **intellectual property (IP)** (i.e., creations of the mind that have commercial value) and the ability to easily download, copy (and potentially modify), and share or distribute digital information. For example, back in the days of analog music, it was all but impossible to create a copy of a song without sacrificing quality. Nowadays, you can almost effortlessly copy your friend's entire digital music library without any quality loss (Figure 1.21); with just a little more effort, you can share it with your friends or even strangers using peer-to-peer networks. Alternatively, you may come across a great photograph or article on the web and share it on Facebook or Instagram without asking for permission from the creator.

Similarly, your school may have licensing agreements with certain vendors, allowing you to install and use certain software while you are a student; yet you may never uninstall the software

FIGURE 1.21

Digital media allows for lossless duplication.



after graduating, or you may lend the software to some friend or family member for personal use. In other cases, you may not be able to afford certain programs and download a pirated version from the web.

Just as digital technology enables lossless duplication of files, **3D printing** enables creating physical three-dimensional objects from digital models. When building prototypes or manufacturing parts, companies have traditionally used machine tools to drill, cut, or mill the part out of a solid piece of material, leaving up to 90 percent of a slab of material ready to go in the recycling or garbage bin. Instead of removing material, 3D printing successively adds thin layers of material to produce the final object. As 3D printers are becoming better, faster, and more affordable, however, they also open up new avenues for quickly and inexpensively producing counterfeit goods. Obviously, this causes problems for consumers expecting to purchase the original product but also leads to tremendous losses in intellectual property when tools are widely available that enable anyone to manufacture their own copy of a product.

Obviously, there are legal issues associated with each of these scenarios. However, there are also ethical issues associated with such behaviors. You may argue that there was no real loss involved for the creator of the files or software, as otherwise you would have gone for a free alternative or chosen not to purchase the product at all, or you may argue that students do not have the funds to purchase expensive software. These issues become even more complex when viewed from a global perspective. In many non-Western societies, using someone else's work is considered praise for the creator, and it is perfectly alright to use a famous song as background music in a YouTube video or to include another person's writing in one's personal blog (or term paper).

In either case, you are using someone else's intellectual property without permission (and often without attribution) and without compensating the creator.

The Need for a Code of Ethical Conduct

Not only has the Internet age found governments playing catch-up to pass legislation pertaining to computer crime, privacy, and security, but it has also created an ethical conundrum. For instance, the technology exists to rearrange and otherwise change photographs, but is the practice ethical? If you can use a computer at your school or workplace for professional purposes but "steal" computer time to do personal business, is this ethical? Is it ethical for companies to compile information about your shopping habits, credit history, and other aspects of your life for the purpose of selling such data to others? Should guidelines be in place to dictate how businesses and others use information and computers? If so, what should the guidelines include, and who should write them? Should there be penalties imposed for those who violate established guidelines? If so, who should enforce such penalties?

Many businesses have devised guidelines for the ethical use of information technology and computer systems; similarly, most universities and many public school systems have written guidelines for students, faculty, and employees about the ethical use of computers. Most organization and school guidelines encourage all system users to act responsibly, ethically, and legally when using computers and to follow accepted rules of online etiquette as well as federal and state laws.

RESPONSIBLE COMPUTER USE. The Computer Ethics Institute is a research, education, and policy study organization that studies how advances in information technology have affected ethics and corporate and public policy. The institute has issued widely quoted guidelines for the ethical use of computers. The guidelines prohibit the following:

- Using a computer to harm others
- Interfering with other people's computer work
- Snooping in other people's files
- Using a computer to steal
- Using a computer to bear false witness
- Copying or using proprietary software without paying for it
- Using other people's computer resources without authorization or compensation
- Appropriating other people's intellectual output

In addition, the guidelines recommend the following:

- Thinking about social consequences of programs you write and systems you design
- Using a computer in ways that show consideration and respect for others

Responsible computer use includes following the guidelines mentioned here. As a computer user, when in doubt, you should review the ethical guidelines published by your school, place of employment, and/or professional organization. Some users bent on illegal or unethical behavior are attracted by the anonymity they believe the Internet affords. But the fact is that we leave electronic tracks as we wander through the web, and many perpetrators have been traced and successfully prosecuted when they thought they had hidden their trails. The fact is, too, that if you post objectionable material on the Internet and people complain about it, your Internet service provider can ask you to remove the material or remove yourself from the service.

INDUSTRY ANALYSIS

Business Career Outlook

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 not only it is 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 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, and social media play a big role. For example, you can join local groups of expats on Facebook to gather useful information, or use online tools such as Babbel to learn a new language or brush up on your language skills. Other suggestions include the following:

1. Read books, newspapers, magazines, and websites about the country.
2. Talk to people who already know the country and its culture.
3. Watch locally produced television as well as follow the local news through international news stations and websites.
4. After arriving in the new country, take time to tour local parks, monuments, museums, entertainment locations, and other cultural venues.
5. Share meals and breaks with local workers and discuss more than just work-related issues, such as current local events and issues.

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 careers. For example, managers use enterprise resource planning systems to manage business operations, doctors use healthcare information systems to analyze patient data and diagnose conditions, law enforcement officers use databases to identify gang members by their tattoos, and farmers use geographical information systems to reduce the application of fertilizers and optimize plant yields. In other words, no matter what your career focus is, information systems will be an important part of your job.

Based on:

Berdan, M. (2014, January 23). Preparing our children for the global economy. *Huffington Post*. Retrieved June 26, 2016, from http://www.huffingtonpost.com/marshall-s-berdan/preparing-our-children-for-the-global-economy_b_4652835.html

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Sophie. (2013, August 19). Global studies programs: Preparing students for a globalized world. *Nerdwallet.com*. Retrieved June 26, 2016, from http://www.nerdwallet.com/blog/nerdscholar/2013/global-studies-programs