

CHAPTER NINE OUTLINE

STUDENT LEARNING OUTCOMES

1. Describe the emerging trends and technologies that will have an impact on the changing Internet.
2. Define the various types of technologies that are emerging as we move toward physiological interaction with technology.
3. Describe the emerging trends of Near Field Communication, Bluetooth, WiFi, cell phones, and RFID, as they relate to the wireless environment.
4. Define and describe emerging technologies that, while purely technology, can and will impact the future.

PERSPECTIVES

- 409 Global Perspective**
Offshore Outsourcing Tutoring
- 415 Industry Perspective**
Wii—Revolutionizing Video Games through Haptic Interfaces
- 418 Industry Perspective**
When RFID Gets “Inked” and Goes Chipless
- 420 Industry Perspective**
The Eyes Have It

WEB SUPPORT

www.mhhe.com/haag

- Searching job databases
- Interviewing and negotiating tips
- Financial aid resources
- Searching for MBA programs
- Free and rentable storage space
- Global statistics and resources

SUPPORTING MODULES



XLM/I Building an E-Portfolio

Extended Learning Module I provides you with hands-on instructions for the most appropriate way to build an e-portfolio, an electronic resume that you publish on the Web in the hope of attracting potential employers. Important issues also cover aspects of building a strong objective statement and using strong action verbs to describe yourself and your accomplishments.



XLM/K Careers in Business

Extended Learning Module K provides an overview of job titles and descriptions in the fields of accounting, finance, hospitality and tourism management, information technology, management, marketing, productions and operations management, and real estate and construction management including what IT skills you should acquire to be successful in each field.

CHAPTER NINE

Emerging Trends and Technologies

Business, People, and Technology Tomorrow

OPENING CASE STUDY: CAN AN E-SOCIETY REPLACE OUR REAL SOCIETY?

If you step back and view our world and society, you'll notice some very interesting changes and trends. People are spending more and more time online. On the average, people now spend more time online than watching TV. The average child under the age of 12 spends only 45 minutes outdoors per week in unstructured activities, with much of the rest of the time spent in structured outdoor activities (mainly sport leagues) or indoors in front of a computer. We are definitely moving in the direction of becoming an e-society, supported and enabled by the many technological advances of today and the promises of the capabilities of technology tomorrow.

Second Life (<http://secondlife.com>) is a form of an e-society on the Internet. There, you can create an avatar of yourself, becoming whoever you want to be. You can buy land on which to build a home or business. Of course, you need to carefully pick the location of your virtual business, based on the location of competitors around you and the amount of traffic that moves through the virtual neighborhood in which you plan to open your business.

Like many social networking sites (Second Life is definitely a form of one of these), you can connect with people with common interests. You can form groups focusing on such topics as movies, music, and hobbies. At all times of the day and night, you can meet people at nightclubs, fashion shows, and art gallery openings.

Second Life supports a fully running economy. You can take risks and be entrepreneurial. If no

one likes what you are doing, you'll go out of business and be forced to sell off assets to pay your debts. If people do like what you're doing, you can become a millionaire in Second Life. And while the money on Second Life is in the currency of Linden Dollars (named after Second Life's creator) you can exchange your Linden Dollars for real U.S. dollars and have them transferred to your bank account. Likewise, you can transfer real dollars from your bank account and buy Linden Dollars in Second Life, enabling you to expand your business, buy more property, and so on.

A basic account to start your virtual life in Second Life is free. You get avatar capabilities but you can't do certain things like own land. If you want those types of privileges, you have to pay a membership fee, \$72 for an annual membership.

Second Life boasts of a population over 6 million worldwide. Do you have a virtual life on Second Life?^{1,2}

Questions

1. How many social networking sites do you belong to? How much time per week, on the average, would you say that you spend on those social networking sites?
2. Beyond social networking sites, how much time in total do you spend online per week? What are the major activities you perform online?
3. Although we are reaching more people online, are we becoming a society that is disassociated with the real environment around us? Is being online so much (often in fantasy environments) good or bad?

Introduction

Technology is changing every day. But even more important than simply staying up with the changes in technology, you need to think about how those changes will affect your life. It's fun to read and learn about "leading- and bleeding-edge" technologies. It is something we encourage you to do. The consequences of those technology changes, however, may have an impact on all our lives more far reaching than you can imagine.

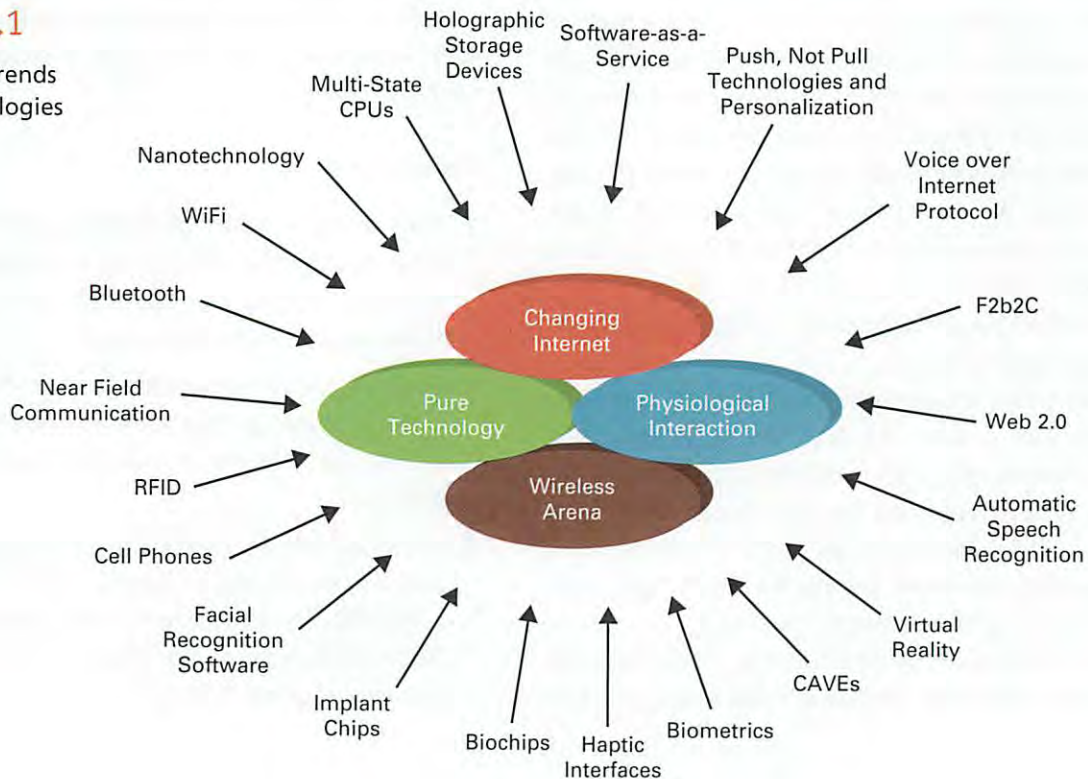
In this final chapter, we will take a look at several leading- and bleeding-edge technologies, including speech recognition, biometrics, implant chips, and chipless RFID, among others. These new technologies can and will impact your personal and business life. Technology for the sake of technology (though fun) is never necessarily a good thing, and can even be counterproductive. Using technology appropriately to enhance your personal life and to move your organization toward its strategic initiatives, on the other hand, is always a good thing.

This has been both an exciting and a challenging chapter for us to write. The excitement is in the opportunity to talk with you about some emerging technological innovations. The challenge has been to not spotlight the technologies themselves overmuch, so as to help you focus on how those technologies will affect your life.

So, as you read this chapter, have fun but don't get caught up exclusively in the technology advances themselves that are on the horizon. Try to envision how those new technologies will change the things that you do and the way you do them, both from a personal and organizational perspective. As throughout this book, we remind you always to consider how to make new technology relevant and productive for you.

To introduce you to just a few of the many new technologies on the horizon, we've chosen those that we believe will have the greatest impact. We present those emerging technologies within the context of four important trends (see Figure 9.1).

Figure 9.1
Emerging Trends and Technologies



The Changing Internet

LEARNING OUTCOME 1

Few technologies have grown to widespread use and changed as fast as the Internet. Over the next several years, you will witness many new Internet-based trends and technologies. Among those will be software-as-a-service; push (not pull) technologies and personalization; F2b2C (which also enables personalization); Internet telephony (i.e., Voice over Internet Protocol, VoIP); and Web 2.0. All of these trends and technologies are fostering the concept of an e-society.

SOFTWARE-AS-A-SERVICE

Software-as-a-service (SaaS) is a delivery model for software in which you pay for software on a pay-per-use basis instead of buying the software outright. As more technology choices become available to you (smart phones, PDAs, tablet PCs) and your need to be mobile using them also increases, these devices may not have the capacity necessary to store all your software needs. For that matter, you may need a given piece of software—photo and video editing software, for instance—perhaps only a couple of times a year. It makes sense then that renting software would be a good alternative. That is what the SaaS model aims to deliver.

In the SaaS model you pay for software on a pay-per-use basis using a personal application service provider. An *application service provider (ASP)* supplies software applications (and often related services such as maintenance, technical support, information storage, and the like) over the Internet that would otherwise reside on customers' computers. We discussed ASPs in Chapter 7 and how the business world is already using them.

Let's focus for a moment on your personal use of an ASP (see Figure 9.2). In the future, ASPs will provide personal productivity software for you to use (for a pay-per-use

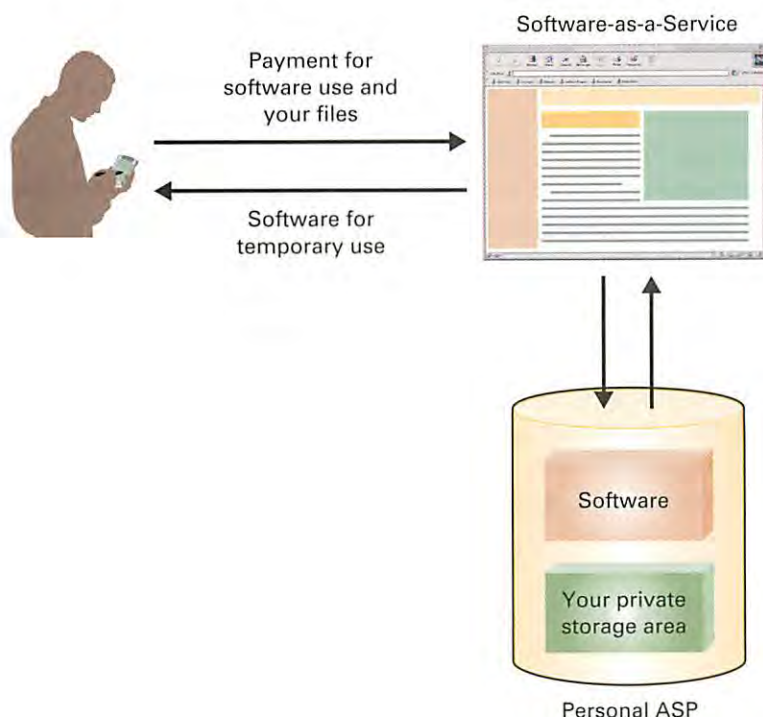


Figure 9.2

The Software-as-a-Service Model and a Personal Application Service Provider (ASP)

fee or monthly subscription fee using the SaaS model) and storage so you can store your files on their Web servers as opposed to on your own personal devices.

For example, you might be in an airport and need to build a workbook with your PDA, which might not have a complete version of Excel. So, you would use your PDA to connect to the Internet and a personal ASP. With your PDA, you would use the personal ASP's Excel software to create your workbook and save it on the ASP's Web server. When you finally got back to the office, you would use your computer there, connect to the same ASP, and retrieve your workbook and save it on your computer.

There are many issues you'll have to consider when determining whether or not to use a personal ASP, with privacy and reliability definitely being important ones. If all your information is on a Web-based server, it will be easier for someone to gain access to it (for the wrong reasons) than if you stored all your information on your home or office computer. When considering reliability, you need to think about what happens if the personal ASP's Web site goes down. How will you perform your work? These are important facets of your personal service level agreement into which you would enter with your personal ASP. In spite of potential drawbacks, we believe personal ASPs and the SaaS model will become a part of your everyday life in the future.

PUSH, NOT PULL, TECHNOLOGIES AND PERSONALIZATION

We live in a *pull* technology environment. That is, you look for, request, and find what you want. On the Internet, for example, you visit a specific site and request information, services, and products. So, you're literally "pulling" what you want. Future emphasis will be on *push* technologies. In a *push technology* environment, businesses and organizations come to you via technology with information, services, and product offerings based on your profile. This isn't spam or mass e-mailings. We briefly discussed the concept of push technology in Chapter 5 within the concepts of mobile computing and m-commerce.

For example, in some parts of the country you can subscribe to a cell service that pushes information to you in the form of video rental information. Whenever you pass near a video store, your cell phone (which is GPS-enabled) triggers a computer within the video store that evaluates your rental history to see if any new videos have arrived that you might be interested in viewing. In this case, the system generates a personal data warehouse of rental history—including dimensions for the day of the week, the time of the day, and video categories—concerning you and then evaluates information in the smaller cubes (see Figure 9.3). The evaluation seeks to affirm that (1) you usually rent videos on that particular day, (2) you usually rent videos during that time of that day, and (3) there is a distinct video category from which you rent videos during that time of the day. If so, the system then checks to see if there are any movies in that category that you haven't rented and that it hasn't previously contacted you about.

If so, the video store computer will call your cell phone with a message concerning a new release. It will also give you street-by-street directions to the video store and hold the video for you. If the video store doesn't have any new releases that might interest you, you won't receive a phone call.

You might also someday receive a personalized pizza delivery message on your television as you start to watch a ball game. The message might say, "We'll deliver your favorite

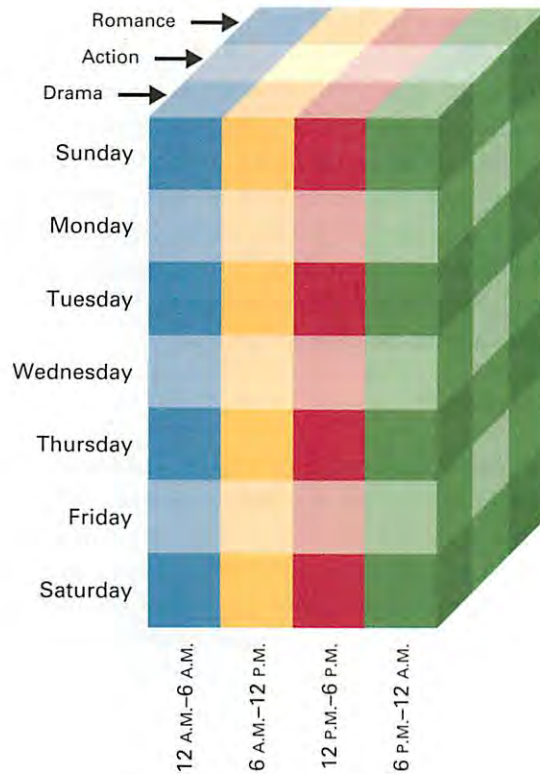


Figure 9.3

Tracking What You Want and When You Want It with a Data Warehouse

sausage and mushroom pizza to your doorstep before the game begins. On your remote control, press the ORDER NOW button.”

Of course, situations such as these rely on IT’s ability to store vast amounts of information about you. Technologies such as databases and data warehouses will definitely play an important role in the development of push technologies that do more than just push spam and mass e-mail. In the instance of the pizza delivery message on your television, a local pizza store would have determined that you like sausage and mushroom pizza and that you order it most often while watching a ball game.

F2B2C: A NEW E-COMMERCE BUSINESS MODEL

In the e-commerce world, business models are identified by the players such as B2B (Business-to-Business) and G2C (Government-to-Consumer). We now have the notion of introducing a third player to create an entirely new e-commerce business model. The first of these new business models to surface is *F2b2C (Factory-to-business-to-Consumer)*, an e-commerce business model in which a consumer communicates through a business on the Internet and directly provides product specifications to a factory that makes the customized and personalized product to the consumer’s specifications and then ships it directly to the consumer.³

You should notice in F2b2C that the “F” and “C” are capitalized while the “b” (for business) is not. In this model, the business is simply an Internet intermediary that provides a communication conduit between the factory and the consumer. When this happens, a form of disintermediation occurs. Broadly defined, *disintermediation* is the use of the Internet as a delivery vehicle, whereby intermediate players in a distribution channel can be bypassed. The travel agent industry is a good example of where disintermediation has occurred. Now, you can connect directly to an airline and purchase tickets,

often receiving bonus mileage if you do. The Internet has disintermediated travel agents, since you need them less.

Think about connecting to a site on the Internet and custom-ordering something like a pair of pants. You would specify your exact size, inseam, waist, hip, and thigh measurements, and so on, and other information such as color, style of pockets, how many belt loops (if any) . . . the list could grow quite long. The Web site would immediately pass along your information to a factory that would create a customized and personalized pair of pants for you and ship them to your door. Is this possible? Well, it already exists to some extent. Later in the chapter, you'll read about how companies are using biometrics to create custom-fitting clothing and shoes.

VOICE OVER INTERNET PROTOCOL (VOIP)

VoIP, or *Voice over Internet Protocol*, allows you to send voice communications over the Internet and avoid the toll charges that you would normally receive from your long distance carrier. Simply put, VoIP allows you to use your Internet connection (which must be broadband such as DSL or cable) to make phone calls. This is different from today's DSL model which splits your phone line so that you can make phone calls and surf the Web at the same time. In today's model, your telephone calls are still routed through your traditional telephone service provider to whom you must pay charges for long distance phone calls. Using VoIP, your telephone calls are routed through a VoIP provider (which may be your ISP) and you pay only a flat monthly fee—usually in the neighborhood of \$20 to \$25 per month—to make unlimited long distance calls.

For home use, you can already use the VoIP services offered by the likes of Vonage, Lingo, Quintum, and AT&T. You can keep your existing phone number and you do have access to a number of value-added features such as call-waiting, caller ID, and so on. Most VoIP providers offer you free unlimited long distance calling only within your country; international long distance calls may still incur an additional fee.

This certainly speaks to the growing importance of the Internet. Most of you probably cannot imagine life without the Internet already. That will be even more true once the Internet becomes the technological infrastructure that also supports all your phone calls. You can read more about VoIP in *Extended Learning Module E*.

WEB 2.0

As discussed in *Extended Learning Module B (The World Wide Web and the Internet)*, the **Web 2.0** is the so-called second generation of the Web and focuses on online collaboration, users as both creators and modifiers of content, dynamic and customized information feeds, and many other engaging Web-based services. To be sure, "2.0" has caught on as a hot buzz term, for example, the Family 2.0 (family members living on and communicating through the Internet), Company 2.0 (the complete Web-enabled company), and TV 2.0 (TV-type broadcast shows delivered via the Web). Some of the exciting applications of Web 2.0 include:

- **Wiki**—a Web site that allows you—as a visitor—to create, edit, change, and often eliminate content. Wikipedia (www.wikipedia.org) is the most popular. Wikis are actually an interesting implementation of sourcing, called **crowdsourcing**, when businesses provide enabling technologies that allow people (i.e., crowds)—instead of a designated paid employee—to create, modify, and oversee the development of a product or service. In the case of a Wiki, that product is information.
- **Social networking site**—a site on which you post information about yourself, create a network of friends, share content such as photos and videos, and

GLOBAL PERSPECTIVE

OFFSHORE OUTSOURCING TUTORING

In Chapter 6 we introduced you to the three major geopolitical forms of outsourcing—onshore, nearshore, and offshore. Each brings with it some distinct advantages and disadvantages when outsourcing the development of IT systems.

But what about education? Many college students go overseas to study—perhaps for a quarter or semester and sometimes for a full four years to get a degree. That’s a form of nearshore or offshore outsourcing. Even earlier in the education process, many K-12 students are turning to offshore outsourcing for tutoring support.

One company providing this is Educomp (www.educomp.com), which provides one-on-one tutoring via the Internet in the areas of math and science. Using Educomp would be considered offshore outsourcing

tutoring because it is based in New Delhi, India. Armed with only a personal computer and a webcam, students here in the United States can get private, real-time tutoring from an Educomp employee.

Most Indian tutoring companies charge in the neighborhood of \$100 per month for unlimited, interactive tutoring over the Internet. Compare that to typical tutoring services in the United States which usually charge around \$100 per hour for face-to-face tutoring.

Moreover, most Indian tutoring service companies guarantee that their tutors have—at a minimum—an undergraduate degree in the discipline they teach. Again, compare that to the United States, where almost 30 percent of high school math teachers do not have either a major or minor in the discipline of math.⁴

communicate with other people. We’ve discussed several social networking sites throughout the text including Myspace, Facebook, Facebox, orkut, and Cyworld (and Second Life in this chapter’s opening case study).

- **Blog**—a Web site in the form of a journal in which you post entries in chronological order and often includes the capabilities for other viewers to add comments to your journal entries.
- **RSS feed**—a technology that provides frequently published and updated digital content on the Web.
- **Podcasting**—generally refers to your ability at any time to download audio and video files for viewing and listening using portable listening devices and personal computers.

Many of these technologies, and the Web 2.0 in general, will forever change how you live your personal life and how you conduct business.

E-SOCIETY

The general and strong trend today in society is toward becoming an e-society. Although we provide no formal definition for an e-society, you can quickly grasp that it is all about living life in, on, and through technology, with the Internet being at the epicenter. People are finding life-long soul mates on Match.com and numerous other dating-related sites; others (especially young people) are flocking to, spending a great deal of time on, and developing friendships on sites such as Myspace, Facebook, and YouTube; people are building very successful home-based e-businesses on eBay; children are receiving tutoring via the Web (see the nearby Global Perspective); just as we wrote this section, PokerStars.net was dealing hand number 9,738,225,821—90 minutes later it dealt hand number 9,739,309,711, meaning that online poker enthusiasts had played over 1 million hands in 90 minutes (roughly 11,000 hands per minute); also at the time we wrote this section, eBay was posting its 60 billionth lot for auction (yes, that is 60,000,000,000).

The simple fact of the matter is that we live in a digital world, with technology not just for the sake of doing business but pervading our personal lives so much so that many people cannot imagine a world without technology. That technology-based world is enabling the growth of an e-society.

LEARNING OUTCOME 2

Physiological Interaction

Right now, your primary physical interfaces to your computer include a keyboard, mouse, monitor, and printer (basically, your input and output devices). These are physical devices, not physiological. Physiological interfaces capture and utilize your real body characteristics, such as your breath, your voice, your height and weight, and even the iris in your eye. Physiological innovations include automatic speech recognition, virtual reality, cave automatic virtual environments, haptic interfaces, and biometrics, along with many others.

AUTOMATIC SPEECH RECOGNITION

An *automatic speech recognition (ASR)* system not only captures spoken words but also distinguishes word groupings to form sentences. To perform this, an ASR system follows three steps.

1. **Feature analysis**—The system captures your words as you speak into a microphone, eliminates any background noise, and converts the digital signals of your speech into phonemes (syllables).
2. **Pattern classification**—The system matches your spoken phonemes to a phoneme sequence stored in an acoustic model database. For example, if your phoneme was “dü,” the system would match it to the words do and due.
3. **Language processing**—The system attempts to make sense of what you’re saying by comparing the word phonemes generated in step 2 with a language model database. For example, if you were asking a question and started with the phoneme “dü,” the system would determine that the appropriate word is do and not due.

ASR is certainly now taking its place in computing environments. The important point is that ASR allows you to speak in a normal voice; thus it supports physiological interaction.

VIRTUAL REALITY

On the horizon (and in some instances here today) is a new technology that will virtually place you in any experience you desire. That new technology is *virtual reality*, a three-dimensional computer simulation in which you actively and physically participate. In a virtual reality system, you make use of special input and output devices that capture your physiological movements and send physiological responses back to you. These devices include:

- **Glove**—An input device that captures and records the shape and movement of your hand and fingers and the strength of your hand and finger movements.
- **Headset (head-mounted display)**—A combined input and output device that (1) captures and records the movement of your head and (2) contains a screen that covers your entire field of vision and displays various views of an environment based on your movements.
- **Walker**—An input device that captures and records the movement of your feet as you walk or turn in different directions.

APPLICATIONS OF VIRTUAL REALITY Virtual reality applications are popping up everywhere, sometimes in odd places. The most common applications are found in the entertainment industry. There are a number of virtual reality games on the market, including downhill Olympic skiing, race-car driving, golf, air combat, and marksmanship. Other applications include

- Matsushita Electric Works—You design your kitchen in virtual reality and then choose the appliances you want and even request color changes.
- Volvo—For demonstrating the safety features of its cars.
- Airlines—To train pilots how to handle adverse weather conditions.
- Motorola—To train assembly-line workers in the steps of manufacturing a new product.⁵
- Health care—To train doctors how to perform surgery using virtual cadavers.⁶

Let's consider the potential ramifications of virtual reality and how you might someday interact with your computer. New virtual reality systems include aroma-producing devices and devices that secrete fluid through a mouthpiece that you have in your mouth. So, you could virtually experience a Hawaiian luau. The aroma-producing device would generate various smells and the mouthpiece would secrete a fluid that tastes like pineapple or roasted pig. If you were using virtual reality to surf big waves, the mouthpiece would secrete a fluid that tastes like salt water.

CAVE AUTOMATIC VIRTUAL ENVIRONMENTS

A *CAVE (cave automatic virtual environment)* is a special 3-D virtual reality room that can display images of other people and objects located in other CAVEs all over the world. CAVEs are *holographic devices*, that create, capture, and/or display images in true three-dimensional form. If you watch any of the *Star Trek* movies, you'll see an example of a holographic device called the holodeck.

In working form, you would enter a CAVE room. At the same time, someone else would enter another CAVE room in another location (see Figure 9.4). Numerous digital video cameras would capture the likenesses of both participants and re-create and send those images to the other CAVEs. Then, you and the other person could see and carry on a normal conversation with each other, and you would feel as if that other person were in the same room with you.

Current CAVE research is also working on the challenges of having other physical objects in the room. For example, if you sat on a couch in your CAVE, the couch would

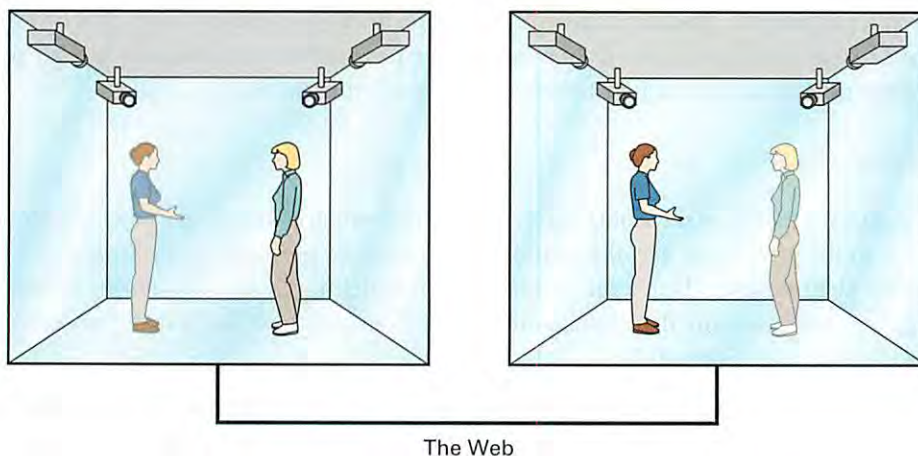


Figure 9.4

CAVEs (Cave Automatic Virtual Environments)

capture the indentation you made in it and pass it to the couch in the other CAVE. That couch would respond by constricting a mesh of rubber inside it so that your indentation would also appear there. And what about playing catch? Which person would have the virtual ball and which person would have the real ball? The answer is that both would have a virtual ball. When throwing it, the CAVE would capture your arm movement to determine the speed, arc, and direction of the ball. That information would be transmitted to the other CAVE, and it would use that information to make the virtual ball fly through the air accordingly.

Unlike virtual reality, in some CAVEs you don't need any special gear. Let your imagination run wild and think about the potential applications of CAVEs. An unhappy customer could call a business to complain. Within seconds, a customer service representative would not answer the phone but rather appear in the room with the unhappy customer. That would be an example of great customer service. Your teacher might never attend your class. Instead the teacher would enter a CAVE and have his or her image broadcast into the classroom. You might not really be in class either but rather a holographic likeness of you. Are CAVEs a realistic possibility? The answer is definitely yes. We believe that CAVEs are the successor to virtual reality. So, virtual reality may not be a long-term technological innovation but rather a stepping-stone to the more advanced CAVE. Whatever the case, CAVEs will not only significantly alter how you interact with your computer (can you imagine the thrill of video games in a CAVE?), they will even more significantly alter how you interact with other people. With CAVE technologies, you can visit your friends and relatives on a daily basis no matter where they live. You may even have television shows and movies piped into your home CAVE.

HAPTIC INTERFACES

A *haptic interface* uses technology to add the sense of touch to an environment that previously only had visual and textual elements. Applications of virtual reality we discussed previously that incorporate the use of gloves and walkers use implementations of haptic interfaces.

Many arcade games include haptic interfaces. For example, when you get on a stationary jet ski and control its movement (on screen) by adjusting your weight side-to-side and leaning backward and forward, you are interfacing with the arcade game via a haptic interface. Many joysticks and game controllers provide feedback to the user through vibrations, which is another form of a haptic interface.

Interacting with an arcade game via a haptic interface is a “fun” application of the technology and one that is making companies a lot of money. But consider this: With a haptic interface, sight-challenged people can feel and read text with their fingers while interacting with a computer. The fact is anyone can use technology to make money. Perhaps the most exciting thing about new technologies is the potential benefits for people. Can you envision ways to use technology to help people less fortunate than yourself?

BIOMETRICS

Biometrics is the use of physiological characteristics—such as your fingerprint, the blood vessels in the iris of your eye, the sound of your voice, or perhaps even your breath—to provide identification. That's the strict and narrow definition, but biometrics is beginning to encompass more than just identification. Consider these real-world applications in place today (see Figure 9.5):

- *Custom shoes*—Several shoe stores, especially those that offer fine Italian leather shoes, no longer carry any inventory. When you select a shoe style you like, you



Biometrics



Figure 9.5

Custom-Fit Clothes
through Biometrics

place your bare feet into a box that scans the shape of your feet. That information is then used to make a custom pair of shoes for you. It works extremely well if your feet are slightly different from each other in size or shape (as is the case with most people). To see this, visit www.digitoe.com.

- *Custom wedding gowns*—Following the custom-fit shoe idea, many bridal boutiques now do the same thing for wedding dresses. Once the bride chooses the style she likes, she steps into a small room that scans her entire body. That information is used to create a wedding dress that fits perfectly. Both custom shoes and custom wedding dresses are examples of the future implementation of F2b2C.
- *Custom bathrobes*—Some high-end spa resorts now actually have patrons walk through a body-scanning device upon check-in. The scanning device measures the patron's body characteristics and then sends that information to a sewing and fabricating facility that automatically creates a custom-fit bathrobe.

BIOMETRIC SECURITY The best form of security for personal identification encompasses three aspects:

1. What you know
2. What you have
3. Who you are

The first—*what you know*—is something like a password, something that everyone can create and has. The second—*what you have*—is something like a card such as an ATM card you use at an ATM (in conjunction with your password, what you know). Unfortunately, most personal identification security systems stop there. That is, they do not include *who you are*, which is some form of a biometric.

It's no wonder crimes like identity theft are spiraling out of control. Without much effort, a thief can steal your password (often through social engineering) and steal what you have. For the latter, the thief doesn't actually have to steal your physical card; he or she simply has to copy the information on it. However, stealing a biometric—such as your fingerprint or iris scan—is much more difficult.

Many banks are currently converting ATMs to the use of biometrics, specifically an iris scan, as the third level of personal identification security. When you open an account and request ATM use, the bank will issue you an ATM card (you pick the password). The bank will also scan your iris and create a unique 512-byte representation of the scan. To use an ATM, you must insert your card, type in your password, and allow the machine to scan your iris. The ATM uses all three forms of identification to match you to your account. You can then perform whatever transaction you wish.

Some private schools for young children now require parents and guardians to submit to iris scans. Once the scan is captured and the person is verified as a parent or guardian, the information is entered into a security database. Then, when the parent or guardian comes to the school to pick up a child, his or her iris scan is compared to the one stored in the database. Parents and guardians cannot, under any circumstances, take a child from the school without first going through verification via an iris scan.

INTEGRATING BIOMETRIC PROCESSING AND TRANSACTION PROCESSING

Once society accepts the use of biometrics for security and identification purposes, organizations of all types will be able to add another dimension of business intelligence to their data warehouses—that dimension will capture and record changes in physiological characteristics (see Figure 9.6).

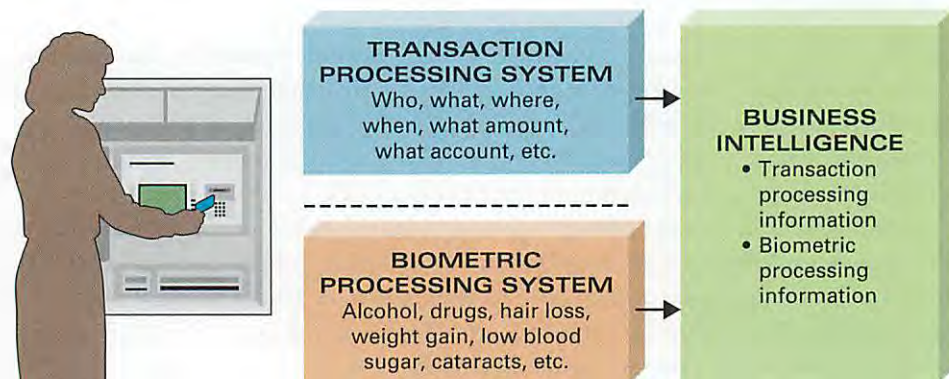
Consider, as a hypothetical example, a woman using an ATM—equipped with iris scanning capabilities—to withdraw cash. Current research suggests that it might be possible to use an iris scan to determine not only that a woman is pregnant but also the sex of the unborn child. (That is a very true statement.) When the woman has her iris scanned, the bank might be able to tell that she is pregnant and expecting a boy. When the woman receives her cash and receipt, the receipt would have a coupon printed on the back for 10 percent off any purchase at Babies “R” Us. Furthermore, the ATM would generate another receipt that says “buy blue.”

The key here is for you to consider that transaction processing systems (TPSs) of the future will be integrated with biometric processing systems (BPSs). The TPS will capture and process the “events” of the transaction—when, by whom, where, and so on. The BPS will capture and process the physiological characteristics of the person performing the transaction. Those physiological characteristics may include the presence of alcohol or illegal drugs, hair loss, weight gain, low blood sugar, vitamin deficiencies, cataracts, and yes—even pregnancy.

When businesses start to gather this type of intelligence, you can leave it to your imagination to envision what will happen. For example, because of the noted pregnancy in our previous example of the woman using an ATM, the bank might offer financing for a mini-van, evaluate the size of the family’s home and perhaps offer special financing for

Figure 9.6

Integrating Biometric and Transaction Processing to Create Business Intelligence



INDUSTRY PERSPECTIVE

WII—REVOLUTIONIZING VIDEO GAMES THROUGH HAPTIC INTERFACES

Just a few short months after its debut, Nintendo's Wii outsold Microsoft's Xbox 360 and Sony's PlayStation 3, its primary competitors. Wii isn't a game but rather a video game console that allows you to play many different video games. Some of the games include *The Legend of Zelda: Twilight Princess*, *WarioWare: Smooth Moves*, and *Super Paper Mario*.

What is so revolutionary about Wii is that it incorporates *haptic interfaces*. Using a wireless controller, you can point at objects on the screen and the game console can also detect your motions and rotations in three dimensions.

When you bowl, for example (a very simple example at that), you see the bowling lane on the screen. You

hold the wireless controller in your hand, press a button and hold it, and then go through the actual motion of bowling, releasing the button when you want to release the virtual bowling ball. You see the result of your actions on screen as the ball rolls down the lane and knocks down the pins.

Other video game publishers have since worked feverishly to add haptic interfaces to their games, including Electronic Arts (*The Godfather*) and Ubisoft (*Princess of Persia: Two Thrones*). As you read this text, you can probably name many more, as we suspect that haptic interface-based video games are here to stay and quickly becoming the mainstay.⁷

a second mortgage so another room can be added, or establish a tuition account for the child and place \$25 in it. These possibilities will further intensify competition in almost all industries.

OTHER BIOMETRICS AND BIOMETRIC DEVICES Biometrics is a “hot topic” in research circles right now. Although we haven't the space to discuss them all, you might want to watch for these:

- **Biochip**—a technology chip that can perform a variety of physiological functions when inserted into the human body. Biochips have been proven in some cases to block pain for people who suffer severe spinal injuries, help paralyzed people regain some portion of their motor skills, and help partially blind people see better.
- **Implant chip**—a technology-enabled microchip implanted into the human body that stores important information about you (such as your identification and medical history) and that may be GPS-enabled to offer a method of tracking.
- **Facial recognition software**—software that provides identification by evaluating facial characteristics.

Whatever becomes a reality in the field of biometrics promises to forever change your life and how you interact with technology.

The Wireless Arena

Throughout this text, we've discussed the technologies that make wireless communications possible and applications of wireless technologies in which companies have gained a significant competitive advantage. We've discussed such wireless technologies as Bluetooth and WiFi—both of which were designed to activate wireless

LEARNING OUTCOME 3

communication via technology devices such as cell phones, printers, network hubs, and of course computers.

- **Bluetooth** is a standard for transmitting information in the form of short-range radio waves over distances of up to 30 feet.
- **WiFi (wireless fidelity)** is a standard for transmitting information in the form of radio waves over distances up to about several miles.

Bluetooth has become very popular for the wireless headsets (actually more like ear pieces) for cell phones. You may own one of these for your cell phone, and you've undoubtedly seen people using them. WiFi is usually the type of wireless communication used in a network environment. Verizon, for example, offers the BroadbandAccess PC Card, which you can use to wirelessly connect your computer or laptop to Verizon's wireless broadband network. Many businesses have private, firewalled wireless networks that use WiFi for their employees.

Let's now turn our attention to (1) cell phones and (2) RFID (radio frequency identification). Cell phones are a significant "disruptive technology" now and will be more so in the future. RFID, while still emerging as a technology, will definitely be around for many years and dramatically change your personal life and the way the business world works.

THE NEXT GENERATION OF CELL PHONE TECHNOLOGY

For most people, a cell phone is a necessary part of life. Even today's most basic cell phones support phone calls (that's obvious) and also real-time text messaging, photos (taking, sending, and receiving), games, and many other features. Tomorrow's cell phones may very well become the only technology you need.

Among the many innovations you'll see in cell phones over the next couple of years will be storage (in the form of a hard disk), processor capability, music enhancements, and video support. Already, new cell phones are being demonstrated that have 2 gigabytes of storage and processor speeds up to 500 Mhz. As these capacities and speeds increase, you may be able to wirelessly connect a keyboard, monitor, mouse, and printer to your cell phone. Your cell phone will essentially become your notebook computer.

Tomorrow's cell phones may spell the end for dedicated MP3 players like Apple's iPod. With enough battery life and storage capacity, many people will opt to use their cell phones for music and eliminate the other piece of equipment they have to carry around to listen to music. Video on demand will also become a reality through your cell phone. Apple's iPhone, for example, combines three technologies: (1) cell phone, (2) iPod, and (3) wireless Internet communication.

But there is a downside. Cell phones are the next great and uncharted space for hackers and viruses. The even worse news is that the development of antivirus cell phone software is very much in its infancy, far behind the capabilities of the people wanting to hack into your cell phone and unleash deadly cell phone viruses. Think about your ISP. It has antivirus software (and many more types of "anti" software such as spam blocker software and anti-spyware software) on its servers to stop a lot of malware from making it to your computer via e-mail. But that doesn't stop all malware from getting to you. You still need all types of "anti" software loaded onto and running on your computer at all times.

When was the last time your cell phone service provider contacted you about new types of "anti" software you can download onto your cell phone for added protection? That has probably never happened, and it should raise a red flag for you. Do you download ring tones from the Internet? If so, your cell phone is susceptible to getting a virus. Some cell phone viruses, created in a laboratory environment, can make international calls and run your battery dead and your bill into the thousands of dollars.

As your cell phone becomes increasingly more important to you—and it will—and becomes increasingly more supportive of complex computer tasks, your challenge will continue to be: Be protected.

RFID (RADIO FREQUENCY IDENTIFICATION)

RFID (radio frequency identification) uses a microchip (chip) in a tag or label to store information, and information is transmitted from, or written to, the tag or label when the microchip is exposed to the correct frequency of radio waves. You're probably already familiar with some implementations of RFID. For example, toll roads have lanes through which drivers can move if they have an RFID device that automatically charges to an account as they drive down the road. Exxon/Mobil provides an RFID-enabled key ring (called Speedpass) to its customers. The Speedpass key ring contains customer account information. A customer, when making a purchase, simply waves the key ring at a reader (as opposed to swiping a credit card). The reader communicates with the RFID chip on the key ring, reads the customer's account information, and proceeds with the account charge.

The most common implementation of RFID is the passive RFID chip (see Figure 9.7). A passive RFID chip has no power source itself and sits idle until passed near a reader that emits radio waves. The antenna surrounding the RFID chip picks up the radio waves and the RFID chip stores those waves as a form of energy until it has enough to literally "jolt" itself to life. The RFID chip then sends its information to the reader, which is connected to some sort of computer system containing account information and the like. After sending its information, the RFID chip goes back into passive mode. This is exactly how Exxon/Mobil's Speedpass RFID key ring works.

RFID IN USE TODAY The current applications of RFID technologies are many, including:

- **Anti-theft car keys**—inside the casing of the car key is an RFID chip. When you insert the key into the ignition, the RFID chip must communicate with the reader in your ignition system (and pass the equivalent of a password) for the car to start. So, it does criminals no good to make a copy of your car key. Of course, if you lose your car keys, it often costs in excess of \$300 to get them replaced.

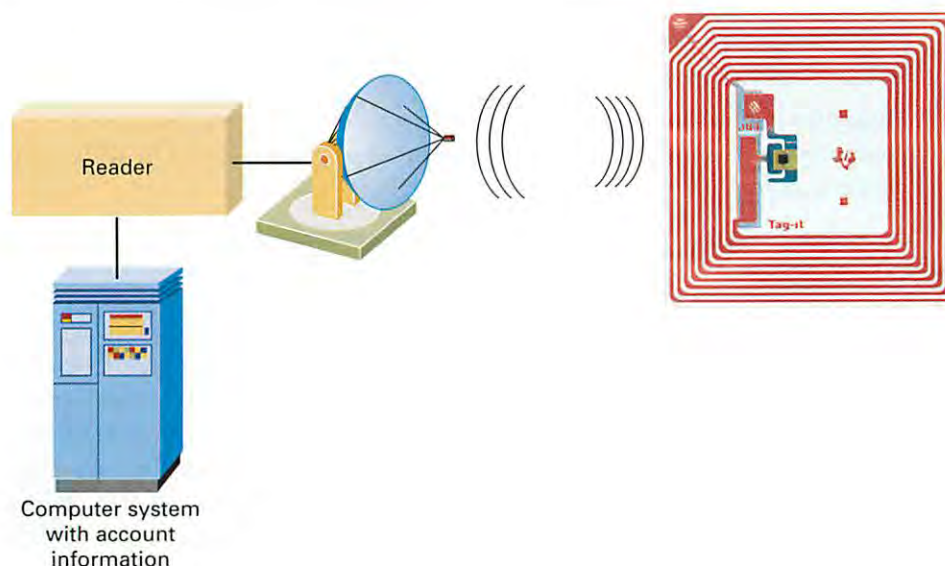


Figure 9.7

How Passive RFID Works

→ WHEN RFID GETS “INKED” AND GOES CHIPLESS

If you look carefully at Figure 9.7 and the RFID chip on the right, you can see the actual “chip” as a very small black rectangle surrounded by numerous red lines. (The red lines are the antenna structure.) Somark Innovation’s latest innovation aims to eliminate the chip itself, creating a *chipless RFID chip*.

It is doing so with a biocompatible chipless RFID ink “tattoo.” The ink is injected into the skin of animals. The chipless RFID, then, can be read as any other traditional RFID chip, that is, while not being in line of sight. According to Ramos Mays, chief scientist at Somark Innovations, “This is a true proof-of-principle [similar to a proof-of-concept prototype we discussed in Chapter

6] and mitigates most of the technological risk. This proves the ability to create a synthetic biometric or *fake fingerprint* with Biocompatible Chipless RFID Ink and read it through hair.”

Somark plans to use this first in the livestock industry to help identify and track cattle. This will certainly help in the case of an outbreak of BSE (Mad Cow Disease). But don’t let your mind stop with chipless RFID ink for animals. What about tattoos for people?

If you get a tattoo using the chipless RFID ink, you could be tracked unknowingly by literally anyone with an RFID reader. How does that make you feel? Do you still want to get a tattoo?⁸

- **Library book tracking**—instead of a bar code on which the ISBN is stored, the RFID chip contains that information. Books are much easier to check in and check out. Even the Vatican library now uses RFID chips in its books. The old inventory process took over 30 days. Using wireless handheld RFID readers, the new inventory process takes only a day.
- **Livestock tracking**—livestock of all kinds is now tagged with RFID chips upon entering the country. The system can then track where the livestock has been on its journey throughout the United States. In the case of a biological outbreak, the system can easily identify which livestock were at the location where the outbreak is believed to have occurred.
- **Supply chain**—almost every major participant in the supply chain process is now mandating that the other participants tag merchandise, trays of merchandise, boxes and skids of merchandise, and so on with RFID chips. These major participants include Wal-Mart, the Department of Defense (DOD), the Food and Drug Administration (FDA), Target, Albertson’s, TESCO (United Kingdom retailer), and Carrefour (France retailer).
- **Passports**—implemented in the United States in 2007, all newly issued U.S. passports now contain an RFID chip in the cover of the passport. The RFID chip contains all your passport information.

The above list is just a few of the thousands of implementations of RFID in the business world.

THE FUTURE OF RFID Today, almost every product is identified uniquely by a UPC (universal product code). However, every like product has the same UPC. So, two cans of diet Coke with lime, for example, have identical UPCs. This makes them indistinguishable. With RFID technologies, each individual piece of merchandise will have a unique EPC (electronic product code). The EPC will include the UPC designation but then also provide a unique number for each different can of diet Coke with lime that can be tied to expiration dates, supply chain movements, and just about anything else you can imagine.

Once again, use your imagination here. If every product in a grocery store can wirelessly communicate with the checkout system, there will be no need to go through that process. While you shop, you'll bag your items when placing them in your cart. When you walk out the front door, an RFID system will wirelessly communicate with your credit card in your wallet, wirelessly communicate with every product in your grocery cart, tally up your bill, and charge your credit card account appropriately.

And think about washing clothes. Suppose you load your washer full of "whites" like socks and towels. Accidentally, you throw in a red shirt but don't see it. Fortunately, each piece of clothing will have an RFID chip that will include washing instructions. Your washing machine will wirelessly communicate with each piece of clothing and determine that one piece does not belong. The washing machine will not work and will notify you that you are mixing clothes.

Are these all realities destined for the future? We believe so. What the future holds for RFID is limited only by your imagination.

Pure Technology

Let's close our look at emerging technologies with a few that have broad applicability in numerous ways. These include nanotechnology, multistate CPUs, and holographic storage devices.

NANOTECHNOLOGY

One of the single greatest drawbacks to technological advances is size. The best chip manufacturers can do is to make circuit elements with a width of 130 nanometers. A nanometer is one-hundred-thousandth the width of a human hair. That may seem very, very small, but current manufacturing technologies are beginning to limit the size of computer chips, and thus their speed and capacity.

Nanotechnologies aim to change all that. As a greatly simplified definition, we would say that *nanotechnology* is a discipline that seeks to control matter at the atomic and sub-atomic levels for the purpose of building devices on the same small scale. So, nanotechnology is the exact opposite of traditional manufacturing. In the latter, for example, you would cut down a tree and whittle it down until it becomes a toothpick. That is, traditional manufacturing starts with something large and continually compresses and slices it until it becomes the desired small size. In nanotechnology, you start with the smallest unit and build up. That is, you start working with atoms and build what you want.

In nanotechnology, everything is simply atoms. Nanotechnology researchers are attempting to move atoms and encourage them to "self-assemble" into new forms. Nanotechnology is a bleeding-edge technology worth watching. The changes it will bring about will be unbelievable. Consider these:

Change the molecular structure of the materials used to make computer chips, for instance, and electronics could become as cheap and plentiful as bar codes on packaging. Lightweight vests enmeshed with sensors could measure a person's vital signs. Analysis of a patient's DNA could be done so quickly and precisely that designer drugs would be fabricated on the fly. A computer the size of your library card could store everything you ever saw or read.^{9,10}

MULTI-STATE CPUS

Right now, CPUs are binary-state, capable of working only with information represented by a 1 or a 0. That greatly slows processing. What we really need to increase speed are

LEARNING OUTCOME 4



Nanotechnology

INDUSTRY PERSPECTIVE

THE EYES HAVE IT

Every year, some 76 million TV ads bombard U.S. TV viewers. And marketers and advertisers are pretty good at determining the return on investment (ROI) for each ad. They simply compare total costs (\$381,000 on the average to produce a 30-second ad on TV plus the costs paid to the show for specific spots) to sales increases, incremental customer inquiries, and the like. But what they aren't good at is dissecting an ad and determining which parts are most effective (or ineffective). Is the text on screen good? Are the visual elements eye appealing? Is the voiceover the right voice? How do all of these work in conjunction to determine the success of an ad?

PreTesting, an ad consulting agency headquartered in New Jersey, has developed eMotion, a system that gives advertisers the answers they need to the above questions. eMotion uses a computer-connected camera

to measure the saccadic motion of the eyes of someone while watching a TV ad. Saccadic motion is the subtle eyeball vibrations that increase when someone sees something of interest. If the voiceover, for example, is presenting the main themes of the ad and the viewer sees a visual element in the ad that interests him or her, the viewer's saccadic motion will increase, meaning that the person is now paying more attention to the visual element than the voiceover.

This sort of information is crucial in developing TV ads that combine the most optimal uses of visual, text, and sound elements. According to Gerald Zaltman, a Harvard professor who specializes in consumer psychology, "Eye-tracking studies are among the most reliable measures of consumer behavior, especially with the technology PreTesting is using."¹¹

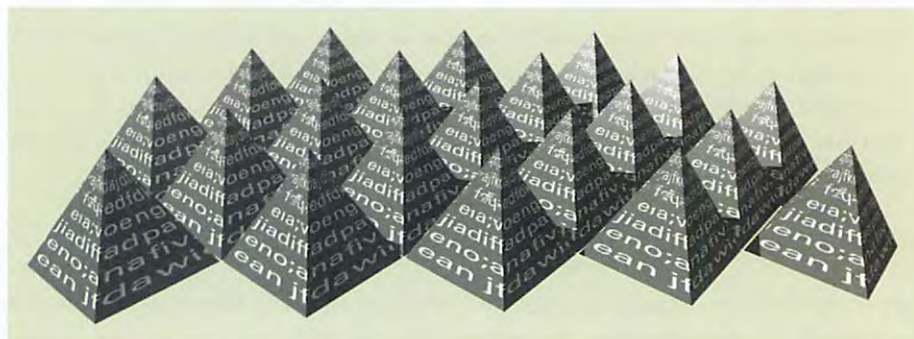
CPUs that are multi-state. *Multi-state CPUs* work with information represented in more than just two states, probably 10 states with each state representing a digit between 0 and 9. When multi-state CPUs do become a reality, your computer will no longer have to go through many of the processes associated with translating characters into binary and then reversing the translation process later. (We covered this process in *Extended Learning Module A*.) This will make them much faster. Of course, the true goal is to create multi-state CPUs that can also handle letters and special characters without converting them to their binary equivalents.

HOLOGRAPHIC STORAGE DEVICES

Again, right now, storage devices store information on a two-dimensional surface, but research in the holographic realm will change that, creating *holographic storage devices* with many sides or faces (see Figure 9.8). This is similar in concept to small cards that you may have seen which change the picture or image as you view the cards from different angles.

Figure 9.8

3-D Crystal-Like Objects
in a Holographic Storage
Device



If and when holographic storage devices do become a reality, you may be able to store an entire set of encyclopedias on a single crystal that may have as many as several hundred faces. Think how small technology will become then.

Most Important Considerations

Throughout this chapter, we've discussed some key emerging trends and technologies. They certainly are exciting and promise that the future will be different and dynamic, to say the least. We have suggested that you anticipate these changes and how they will affect you personally and in your career.

As we close this chapter (and perhaps your studies in this course), let's take a close look at five key topics. Each is a culmination in some way of the material you've learned in this course. Each is inescapable in that it will happen and you must deal with it. Finally, each is vitally important and reaches far beyond the technologies that either necessitate or support it. For you, these last few pages are a chance to reflect on what you've learned and to place that knowledge within the bigger picture.

THE NECESSITY OF TECHNOLOGY

Like it or not, technology is a necessity today. It's hard to imagine a world without it. Just as we need electricity to function on an everyday basis, we need technology as well.

Of course, that doesn't mean you should adopt technology just for the sake of the technology or only because it sounds fun. Rather, you need to carefully evaluate each technology and determine if it will make you more productive, enhance your personal life, enrich your learning, or move your organization in the direction of its strategic goals and initiatives.

Technology is not a panacea. If you throw technology at a business process that doesn't work correctly, the result will be that you'll perform that process incorrectly millions of times faster per second. At the same time, you can ill afford to ignore technology when it really will help you and your organization become more efficient, effective, and innovative.

CLOSING THE GREAT DIGITAL DIVIDE

We must, as a human race, completely eliminate the great digital divide. The *great digital divide* refers to the fact that the world is becoming one marked by "have's" and "have not's" with respect to technology. That is, the traditional notion of a third world economy is now being defined by the extent to which a country has only limited access to and use of technology.

The power of technology needs to be realized on a worldwide scale. We cannot afford to have any technology-challenged nation or culture (within reason). The great digital divide only adds to global instability. If you live and work in a technology-rich country, don't keep it to yourself. When possible, take technology to other countries by creating international business partnerships and strategic alliances. Join in a nonprofit program to spread computer literacy and access in a third world country, or in this country. This may afford you great satisfaction, and the world will benefit greatly from your efforts.

TECHNOLOGY FOR THE BETTERMENT OF SOCIETY

Life isn't just about making money. As you approach the development and use of technological innovations (or even standard technologies), think in terms of the betterment

of people and society in general. (Making money and helping people often go hand in hand, in fact.)

Medical research is performing marvelous work in the use of technology to treat ailments and cure diseases. But if these efforts are purely profit-driven, we may never wholly realize the fruits of them. For example, therapists are using virtual reality to teach autistic people to cope with increasingly complex situations. We know for a fact that this use of technology isn't making anyone a lot of money. But it isn't always about making money. It's about helping people who face daily challenges far greater than ours. You're fortunate to be in an environment of learning. Give back when you have the chance.

EXCHANGING PRIVACY FOR CONVENIENCE

On a personal level, you need to consider how much of your personal privacy you're giving up in exchange for convenience. The extreme example is GPS-enabled implant chips. The convenience is knowing where you are and being able to get directions to your destination. But you're obviously giving up some privacy. Is this okay? Convenience takes on many forms. When you use a discount card at a grocery store to take advantage of sales, that grocery store then tracks your purchasing history in great detail. You can bet that the grocery store will use that information to sell you more tailored products.

It really is a trade-off. In today's technology-based world, you give up privacy when you register for sweepstakes on certain Web sites. You give up privacy just surfing the Web because tracking software monitors your activities. Even when you click on a banner ad, the Web site you go to knows where you came from. Although such trade-offs may seem insignificant, small trade-offs can add up to a big trade-off over time.

Because you are very much a part of this trend, it's often hard to see the big picture and understand that every day you're giving up just a little more privacy in exchange for a little more convenience. Don't ever think that organizations won't use the information they're capturing about you. They're capturing it so they can use it. Of course, much of it will be used to better serve you as a customer, but some of it may not.

ETHICS, ETHICS, ETHICS

As our final note to you, we cannot stress enough again the importance of ethics as they guide your behavior toward other people in your career. We realize that business is business and that businesses need to make money to survive. But the recent scandals involving Enron and others in the corporate world should be a reminder of how important your personal ethical compass is to you. Success shouldn't come to the detriment of other people. It's quite possible to be very ethical and very successful. That's our challenge to you.

Summary: Student Learning Outcomes Revisited

1. **Describe the emerging trends and technologies that will have an impact on the changing Internet.** Emerging trends and technologies that will have an impact on the changing Internet include:
 - *Software-as-a-service (SaaS)*—delivery model for software in which you pay for software on a pay-per-use basis instead of buying the software outright.

- **Push**—technology environment in which businesses and organizations come to you via technology with information, services, and product offerings based on your profile.
 - **F2b2C (Factory-to-business-to-Consumer)**—an e-commerce business model in which a consumer communicates through a business on the Internet and directly provides product specifications to a factory that makes the customized and personalized product to the consumer's specifications and then ships it directly to the consumer.
 - **VoIP (Voice over Internet Protocol)**—allows you to send voice communications over the Internet and avoid the toll charges that you would normally receive from your long distance carrier.
 - **Web 2.0**—second generation of the Web focusing on online collaboration, users as both creators and modifiers of content, dynamic and customized information feeds, and many other services.
- 2. Define the various types of technologies that are emerging as we move toward physiological interaction with technology.** Emerging technologies in the area of physiological interaction include:
- **Automatic speech recognition (ASR)**—a system that not only captures spoken words but also distinguishes word groupings to form sentences.
 - **Virtual reality**—three-dimensional computer simulation in which you actively and physically participate.
 - **CAVE (cave automatic virtual environment)**—special 3-D virtual reality room that can display images of other people and objects located in other CAVEs all over the world.
 - **Haptic interface**—uses technology to add the sense of touch to an environment that previously only had visual and textual elements.
 - **Biometrics**—use of physiological characteristics—such as your fingerprint, the blood vessels in the iris of your eye, the sound of your voice, or perhaps even your breath—to provide identification.
- 3. Describe the emerging trends of Near Field Communication, Bluetooth, WiFi, cell phones, and RFID, as they relate to the wireless environment.** Emerging trends related to the wireless environment include:
- **Near Field Communication (NFC)**—short-range wireless technology developed mainly for use in mobile phones.
 - **Bluetooth**—standard for transmitting information in the form of short-range radio waves over distances of up to 30 feet.
 - **Wifi**—standard for transmitting information in the form of radio waves over distances up to about several miles.
 - Cell phones—advances in storage capacity, processor capability, music enhancements, and video support—and threats such as viruses and hackers.
 - **RFID (radio frequency identification)**—the use of a chip or label to store information, by which information is transmitted from, or written to, the tag or label when the chip is exposed to the correct frequency of radio waves.
- 4. Define and describe emerging technologies that, while purely technology, can and will impact the future.** These technologies include:
- **Nanotechnology**—a discipline that seeks to control matter at the atomic and sub-atomic levels for the purpose of building devices on the same small scale.
 - **Multi-state CPU**—works with information represented in more than just two states, probably 10 states with each state representing a digit between 0 and 9.
 - **Holographic storage device**—a device that stores information on a storage medium that is composed of 3-D crystal-like objects with many sides or faces.

CLOSING CASE STUDY ONE

THE NBA GOES NFC

You might hold a future technological innovation in your hand right now if you attended an Atlanta Hawks basketball game during the 2006–2007 season. The Atlanta Hawks distributed some 250 Nokia 3220 phones to season ticket holders who also have Chase Visa cards and are Cingular Wireless subscribers.

The phones are NFC-enabled. *NFC*, or *Near Field Communication*, is a wireless transmission technology being developed primarily for cell phones to support mobile commerce (m-commerce) and other cell phone activities. NFC—unlike other wireless technologies such as Bluetooth and Wifi which use radio waves for communication—works on magnetic field induction.

Atlanta Hawk season ticket holders lucky enough to be given one of these phones could use them for many purposes including:

- Buying food, drinks, merchandise, and other concessions
- Downloading player animations, ring tones, and wallpaper (of the Atlanta Hawks team, of course)

For buying merchandise, the phones contained electronic wallet (e-wallet) software that acted as an intermediary between the concession reader device that contained the total for the purchase amount and the user's Chase Visa card. Without fumbling around to find cash or a credit card, the user simply waved his or her phone within four centimeters of the reader device. The person's Chase Visa account was then automatically charged the appropriate amount. This is quite similar to how RFID works, which we covered in this chapter. However, unlike many RFID implementations, which require you to carry a special RFID-enabled card or other device, NFC technology is embedded into your cell phone, something that most people carry around with them all the time.

For downloading content to the cell phone, the Atlanta Hawks created 60 smart posters. These smart posters—although seemingly just paper posters on the wall—contained electronic content such as ring tones and images. Using the phone, a season ticket holder could select the content he or she wanted, and then—again—wave the phone within four cen-

timeters of the poster. The selected content was then downloaded to the cell phone. Player animations were free, but other content such as ring tones cost about \$2 to \$3 each, with the billing being handled by Cingular.

Near Field Communication is a technology that has been endorsed by just about every mobile network operator. Further, most payment service providers (i.e., banks, credit card issuers, debit card issuers, and prepaid card issuers) have also endorsed NFC as the short-range communications media of the future for mobile phones. Big companies like Motorola and MasterCard are among the many endorsing the use of NFC.

The goal is to allow you to keep your account and card information on your cell phone. Most people now have cell phones and carry them with them wherever they go. In the case of bank and credit card accounts, the e-wallet software interacts with very little private financial information stored on the cell phone. The cell phone typically contains only an account number. The e-wallet software uses that account number to connect to the issuer's infrastructure via the cell phone network. On the back end on the issuer's side, account information is accessed and updated. The only communication back to the e-wallet software on the cell phone is that the transaction was either successful or denied.

When fully implemented, NFC-enabled financial transactions via your cell phone will enable you to buy a variety of goods and services. Some of these purchases can be extremely small (called micropayments), even less than \$1. These types of purchases will be extremely fast, enabling retailers to move people more quickly through lines.

You will probably even be able to buy some types of merchandise, store it on your cell phone, and save it for later "consumption" or use. For example, at a movie theater you could buy tickets early in the day for an evening show time and save them on your cell phone. When you get to the movie theater in the evening, you walk directly through the line where tickets are taken, stopping only long enough for a reader device to determine that your cell phone has the appropriate tickets.^{12,13}

Questions

1. Do a little research on the Web. To what extent has Near Field Communication and these types of contactless payments become a reality? What cell phone service providers offer electronic wallet capabilities?
2. How might NFC-enabled financial transactions support the software-as-a-service model? How might NFC-enabled financial transactions support the push technology concept?
3. What about security? If someone steals your NFC-enabled phone, they may have access to your accounts. What are providers doing in the area of security?
4. How are NFC-enabled financial transactions further evidence that we are moving toward an e-society? Can you foresee a time when physical cards (credit, debit, and the like) will no longer be needed? What other cards do you carry in your wallet that could become a part of your e-wallet in your phone?
5. How can NFC-enabled financial transactions be used to support the notion of the *Long Tail* we discussed in Chapter 5?

CLOSING CASE STUDY TWO

TRACKING YOUR CHILDREN

You may not have children yet, but chances are that you someday will. Given the number of predators looking for children, parents today are more concerned for the safety of their children than ever before.

CELL PHONES FOR THE PARENTS OF CHILDREN

Most adults have cell phones, including those who also have children. And now children are quickly becoming the largest group of purchasers of cell phones and cell phone services. According to M:Metrics (a wireless research company), Sprint alone has 2.4 million subscribers ages 13 to 17 in the United States. And that doesn't include children who have cell phone services with AT&T, Cricket, and the many other cell phone service providers.

Even children as young as four years old are getting cell phones. For these young children, many cell phone manufacturers provide cell phones with only four (very large) buttons. The parents of these youngsters program the cell phone by providing a different phone number for each large button. That way children don't even have to remember a phone number, just which button to push.

Moreover, new cell phone services are available that allow parents to track the location of a child using global positioning system (GPS) technology. Such a ser-

vice, called *Family Locator*, is offered by Sprint. The service is for families with multiple phones on the same service plan. When signing up, parents can specify which of the individual phones they would like to track via GPS technology.

Then, using the Locator function, a parent can view on-screen (or at a secure Web site) the location of a particular phone, and thus the location of the child using the phone. If GPS capability isn't available at the location of the child, the system can still determine location based on the nearest cell phone tower.

Parents can also program a child's phone to immediately send a text message upon safe arrival to school, a day care center, or any other location. The child doesn't have to take any action to send the text message. Using GPS technology, when the location of the cell phone matches the preassigned text messaging location, the phone automatically sends the message.

TRACKING YOUR CHILD DRIVING A CAR

Horizon Technologies recently released a GPS tracking-based technology that many parents are installing in the cars of their children. Called *Millennium Plus*, the system allows an administrator (a parent, in this case) to access a secure Web site and view tremendous detail of the car on which the device is installed. This information can include speed, direction, and real-time maps

showing the car in motion. Further, the *Millennium Plus* allows parents to disable the starter and lock and unlock doors remotely.^{14,15}

Questions

1. After reading this case study, you may immediately think of yourself and your parents' ability to track you. But think about parents with a 10-year-old child. Is it an invasion of that child's privacy? Why or why not? Up to what age do you believe parents should be able to track the location of a child? Justify your answer.
2. With a service like *Family Locator*, you may never again lose your cell phone. You could, when signing up for cell phone service, specify that you would like to track yourself. If you ever lose your phone, you could log on to a Web site and determine its location. Is this a service you would be interested in? How much would you be willing to pay each month for this service?
3. When a parent does a location search on a child (based on the location of the child's cell phone), should the child's cell phone notify him/her that a parent is looking for him/her? Should parents disclose when they are tracking their children or is this a parental right? Justify your answer.
4. Think broadly for a moment concerning other applications of these sorts of tracking technology. What if a parent didn't want a child to go into a certain store? Could this sort of tracking technology be used such that the parent would receive a text message if the child entered that store or parked near that store? Has this taken tracking capabilities too far? Why or why not?
5. Think about your partner (girlfriend, boyfriend, whatever). Would the two of you be willing to establish reciprocal service that allowed each of you to track the other? Why or why not?

Key Terms And Concepts

Application service provider (ASP), 405	Feature analysis, 410	Push technology, 406
Automatic speech recognition (ASR), 410	Glove, 410	Radio frequency identification (RFID), 417
Biochip, 415	Haptic interface, 412	RSS feed, 409
Biometrics, 412	Headset (head-mounted display), 410	Social networking site, 408
Blog, 409	Holographic device, 411	Software-as-a-service (SaaS), 405
Bluetooth, 416	Holographic storage device, 420	Virtual reality, 410
Cave automatic virtual environment (CAVE), 411	Implant chip, 415	Voice over Internet Protocol (VoIP), 408
Crowdsourcing, 408	Language processing, 410	Walker, 410
Disintermediation, 407	Multi-state CPU, 420	Web 2.0, 408
Facial recognition software, 415	Nanotechnology, 419	WiFi (wireless fidelity), 416
Factory-to-business-to-Consumer (F2b2C), 407	Near Field Communication (NFC), 424	Wiki, 408
	Pattern classification, 410	
	Podcasting, 409	

Short-Answer Questions

1. How will software-as-a-service (SaaS) make use of a personal application service provider?
2. How does push technology differ from spam?
3. What is disintermediation? How does the F2b2C e-commerce model support disintermediation?

4. What exciting applications are associated with the Web 2.0?
5. How does automatic speech recognition work?
6. What are the devices commonly associated with virtual reality?
7. What role do haptic interfaces play?
8. What is the best form of personal identification?
9. How can you expect cell phones to change in the future?
10. What is RFID?
11. How does nanotechnology differ from traditional manufacturing?

Assignments and Exercises

1. SELLING THE IDEA OF IMPLANT CHIPS AT YOUR SCHOOL Let's assume for a moment that your team is in favor of using implant chips that contain vitally important information such as identification and medical information. Your task is to put together a sales presentation to your school that would require all students to obtain implant chips. In your presentation, include the following:

- A. The school-related information that each implant chip would contain
- B. The nonschool-related information that each implant chip would contain
- C. The processes within your school that would use the information on the implant chips
- D. The benefits your school would realize by requiring implant chips
- E. The benefits students would realize by having implant chips

Your presentation should be no more than five minutes, so it must be a powerful selling presentation.

2. FINDING A GOOD AUTOMATIC SPEECH RECOGNITION SYSTEM Research the Web for automatic speech recognition (ASR) systems. Make a list of the ones you find. What are the prices of each? Are they speaker-independent or speaker-dependent? Do they support continuous speech recognition or discrete speech recognition? What sort of add-on vocabularies can you purchase? How comfortable would you feel speaking the contents of a term paper as opposed to typing it? Would you have to be more or less organized to use speech recognition as opposed to typing? Why?

3. UNDERSTANDING THE RELATIONSHIPS BETWEEN TRENDS AND TECHNOLOGICAL INNOVATIONS In this chapter, we presented you with numerous key technologies and how they relate to four important trends. (See Figure 9.1 on page 404 for the list of technologies and trends.) For each trend, identify all the technologies presented in this chapter that can have an impact. For each technology that you do identify, provide a short discussion of how it might have an impact.

4. RESEARCHING APPLICATIONS OF RFID Visit the Web and perform a search on RFID for applications that we didn't discuss in this chapter. Prepare a short PowerPoint presentation highlighting each. Also, search the Web for the leading providers of RFID technologies. What companies did you find? Does one seem to stand out above the rest? If so, which is it?

5. RESEARCHING INTELLIGENT HOME APPLIANCES Visit a local appliance store in your area and find three home appliances that contain some sort of intelligence (i.e., an embedded computer chip that takes over some of the functionality and decision making). For each appliance, prepare a short report that includes the following information:

- A description and price for the intelligent home appliance
- The "intelligent" features of the appliance
- How those features make the appliance better than the nonintelligent version

Discussion Questions

1. There is currently much legislation pending in many states that would make it illegal for people to use a cell phone while driving a car. The reason is that society has already noticed a significant increase in the number of traffic accidents in which one of the drivers involved in the accident was using a cell phone. Think beyond that for a moment and include wearable computers. As this new technology becomes more widely available, isn't it possible for someone to be driving a car while using a computer? Should the government enact legislation to prevent it? Why or why not?
2. In a push technology environment, businesses and organizations will come to you with information, services, and product offerings based on your profile. How is a push technology environment different from mass mailings and spam? Is it an invasion of your privacy to have organizations calling you on your cell phone every time you come near a store? Why or why not? Should you be able to "opt in" or "opt out" of these offerings? Is this really any different from someone leaving a flyer at your house or on your car while it's parked in a parking lot?
3. There are three steps in automatic speech recognition (ASR): feature analysis, pattern classification, and language processing. Which of those three steps is the most challenging for a computer to perform? Why? Which of those three steps is the least challenging for a computer to perform? Why? If ASR systems are to become automatic speech understanding systems, which step must undergo the greatest improvement in its capabilities? Why?
4. Much debate surrounds the use of biometrics. Many people like it because biometrics can provide identification and increase security. Other people see it as a tremendous invasion of your privacy. Just as you read in this chapter, a bank—by using biometric identification—may be able to tell if a woman is pregnant. So, the greatest challenge to overcome is not technological but rather societal. What do you think needs to happen for society to accept the use of biometrics? How long do you think it will be before society accepts the use of biometrics? In what year do you believe the U.S. federal government will begin requiring a biometric of every newborn child?
5. What are the ethical dilemmas associated with using facial recognition software? Is the use of this type of software really any different from a store asking to see your driver's license when you use your credit card? Why or why not? Should the government be able to place digital video cameras on every street corner and use facial recognition software to monitor your movements? Why or why not?
6. When (and if) CAVEs become a common reality, you'll be able to visit your family and friends anytime you want no matter where they live. What sort of impact will this have on the travel industry? If you can see your relatives in a CAVE as often as you want, will you be more or less inclined to buy a plane ticket and visit them in person? Why or why not?

CHAPTER PROJECTS

Group Projects

- Assessing the Value of Outsourcing Information Technology: Creating Forecasts (p. 472)
- Making the Case with Presentation Software: Information Technology Ethics (p. 474)
- Developing an Enterprise Resource Planning System: Planning, Reporting, and Data Processing (p. 477)
- Assessing a Wireless Future: Emerging Trends and Technology (p. 478)
- Evaluating the Next Generation: Dot-Com ASPs (p. 479)
- Evaluating the Security of Information: Wireless Network Vulnerability (p. 486)

e-Commerce Projects

- Interviewing and Negotiating Tips (p. 489)
- Free and Rentable Storage Space (p. 491)
- Financial Aid Resources (p. 493)
- Global Statistics and Resources (p. 494)
- Searching for MBA Programs (p. 499)
- Searching Job Databases (p. 499)