



Shelly / Vermaat

Conquering Computers

Computer Science Course 103

Iowa State University

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CHAPTER ONE

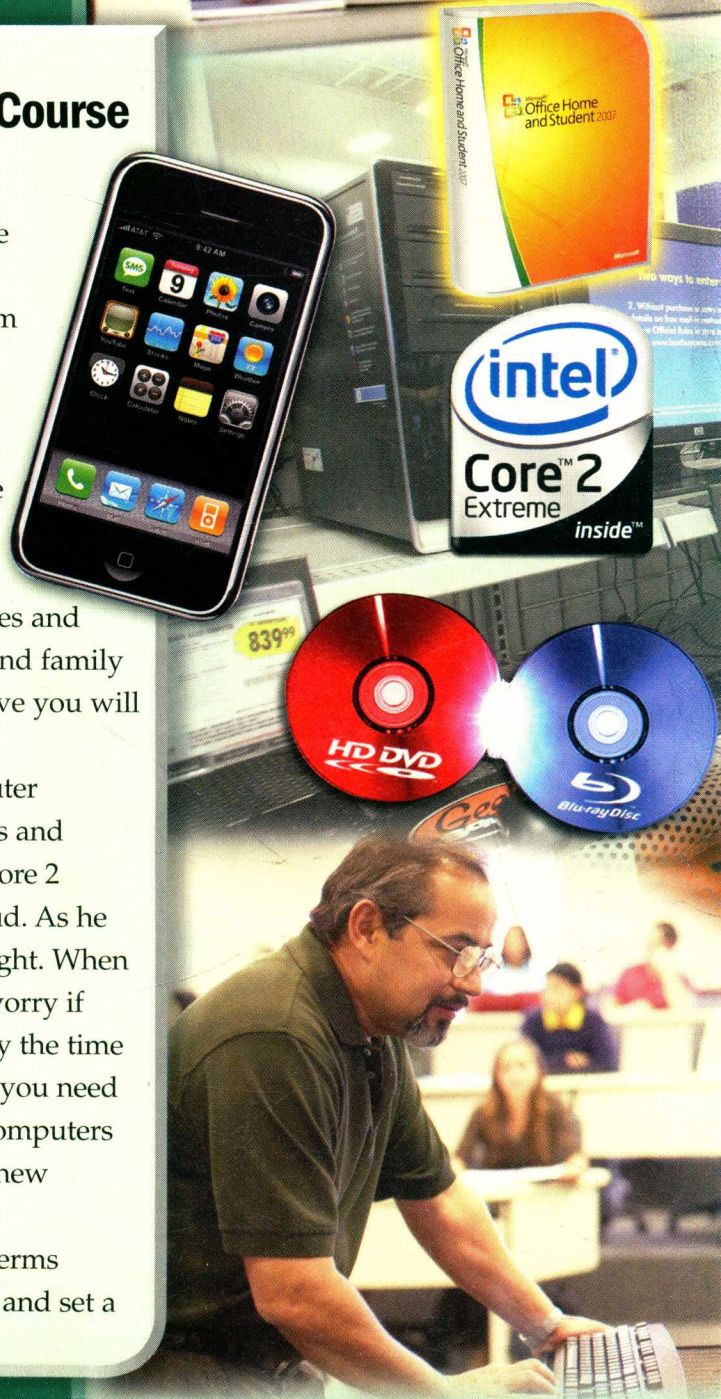
Introduction to Computers

Picture Yourself Taking a Computer Course

Before the first lecture begins in your Introduction to Computers class, you hear several classmates announce they will meet in the student lounge after class to talk about homework and form study groups. A few of them confess they know little about computers and are looking forward to learning more. As they talk, you think about your experiences with computers. You had a beginning programming class in high school. You use Windows Vista, Office 2007, and the Internet on your home computer. You communicate with friends using your iPhone. With your digital camera, you take pictures and e-mail them to family members. Most of your friends and family consider you to be rather computer savvy, so you believe you will not need a study group.

During the lecture, the instructor reads several computer advertisements to the class. The ads use computer terms and acronyms you have never heard, like eSATA, Blu-ray, Core 2 Extreme, VoIP, Web 2.0, wireless access point, and earbud. As he reads, you quickly realize you know less than you thought. When he finishes reading, the instructor tells the class not to worry if some or most of the words in the ads are unfamiliar. "By the time this course is over," he says, "you will learn everything you need to know to buy a computer and will understand how computers are used in society." Excited by the prospect of gaining new knowledge, you decide to join the study group after all.

Read Chapter 1 to become familiar with some of the terms mentioned above, discover practical uses of computers, and set a foundation for further learning in this book.



OBJECTIVES

After completing this chapter, you will be able to:

1. Recognize the importance of computer literacy
2. Define the term, computer
3. Identify the components of a computer
4. Discuss the advantages and disadvantages of using computers
5. Recognize the purpose of a network
6. Discuss the uses of the Internet and World Wide Web
7. Distinguish between system software and application software
8. Describe the categories of computers
9. Identify the elements of an information system
10. Describe the various types of computer users
11. Discuss various computer applications in society

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Dell
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TECHNOLOGY TRAILBLAZERS

Bill Gates
Anne Mulcahy



A WORLD OF COMPUTERS

Computers are everywhere: at work, at school, and at home. Many daily activities either involve the use of or depend on information from a computer. As shown in Figure 1-1, people use all types and sizes of computers for a variety of reasons and in a range of places. While some computers sit on top of a desk or on the floor, mobile computers and mobile devices are small enough to carry. Mobile devices, such as many cell phones, often are classified as computers.

Computers are a primary means of local and global communication for billions of people. Consumers use computers to correspond with businesses, employees with other employees and customers, students with classmates and teachers, and family members and military personnel with friends and other family members. In addition to sending text-based messages,

people use computers to share pictures, drawings, journals, music, and videos.

Through computers, society has instant access to information from around the globe. Local and national news, weather reports, sports scores, airline schedules, telephone directories, maps and directions, job listings, credit reports, and countless forms of educational material always are accessible. From the computer, you can make a telephone call, meet new friends, share opinions or life stories, book flights, shop, fill prescriptions, file taxes, or take a course.

At home or while on the road, people use computers to manage schedules, balance check-books, pay bills, transfer funds, and buy or sell stocks. Banks place automated teller machines (ATMs) all over the world, so that customers can deposit and withdraw funds at anytime. At the grocery store, a computer tracks purchases, calculates the amount of money due, and often



FIGURE 1-1 People use all types and sizes of computers in their daily activities.

generates coupons customized to buying patterns. Vehicles include onboard navigation systems that provide directions, call for emergency services, and track the vehicle if it is stolen.

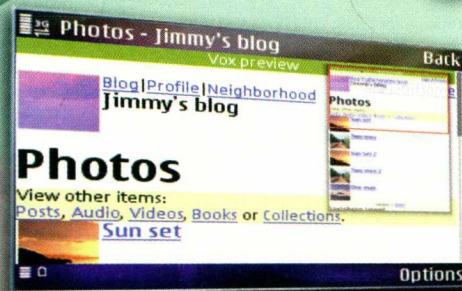
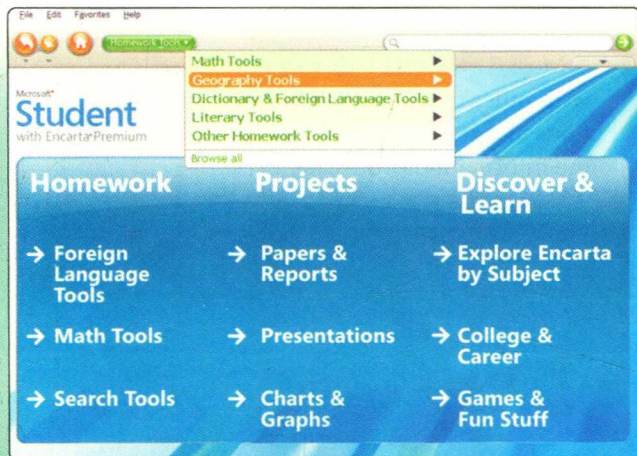
In the workplace, employees use computers to create correspondence such as e-mail messages, memos, and letters; calculate payroll; track inventory; and generate invoices. Some applications such as automotive design and weather forecasting use computers to perform complex mathematical calculations. At school, teachers use computers to assist with classroom instruction. Students complete assignments and conduct research on computers in lab rooms, at home, or elsewhere. Instead of attending class on campus, some students take entire classes directly from their computer.

People also spend hours of leisure time using a computer. They play games, listen to

music or radio broadcasts, watch or compose videos and movies, read books and magazines, share stories, research genealogy, retouch photos, and plan vacations.

As technology continues to advance, computers are becoming more a part of everyday life. Thus, many people believe that computer literacy is vital to success in today's world. **Computer literacy**, also known as *digital literacy*, involves having a current knowledge and understanding of computers and their uses. The requirements that determine computer literacy change as technology changes.

This book presents the knowledge you need to be computer literate today. As you read this first chapter, keep in mind it is an overview. Many of the terms and concepts introduced in this chapter will be discussed in more depth later in the book.



WHAT IS A COMPUTER?

A **computer** is an electronic device, operating under the control of instructions stored in its own memory, that can accept data, process the data according to specified rules, produce results, and store the results for future use.

Data and Information

Computers process data into information. **Data** is a collection of unprocessed items, which can include text, numbers, images, audio, and video. **Information** conveys meaning and is useful to people.

As shown in Figure 1-2, for example, computers process several data items to print information in the form of a grade report.

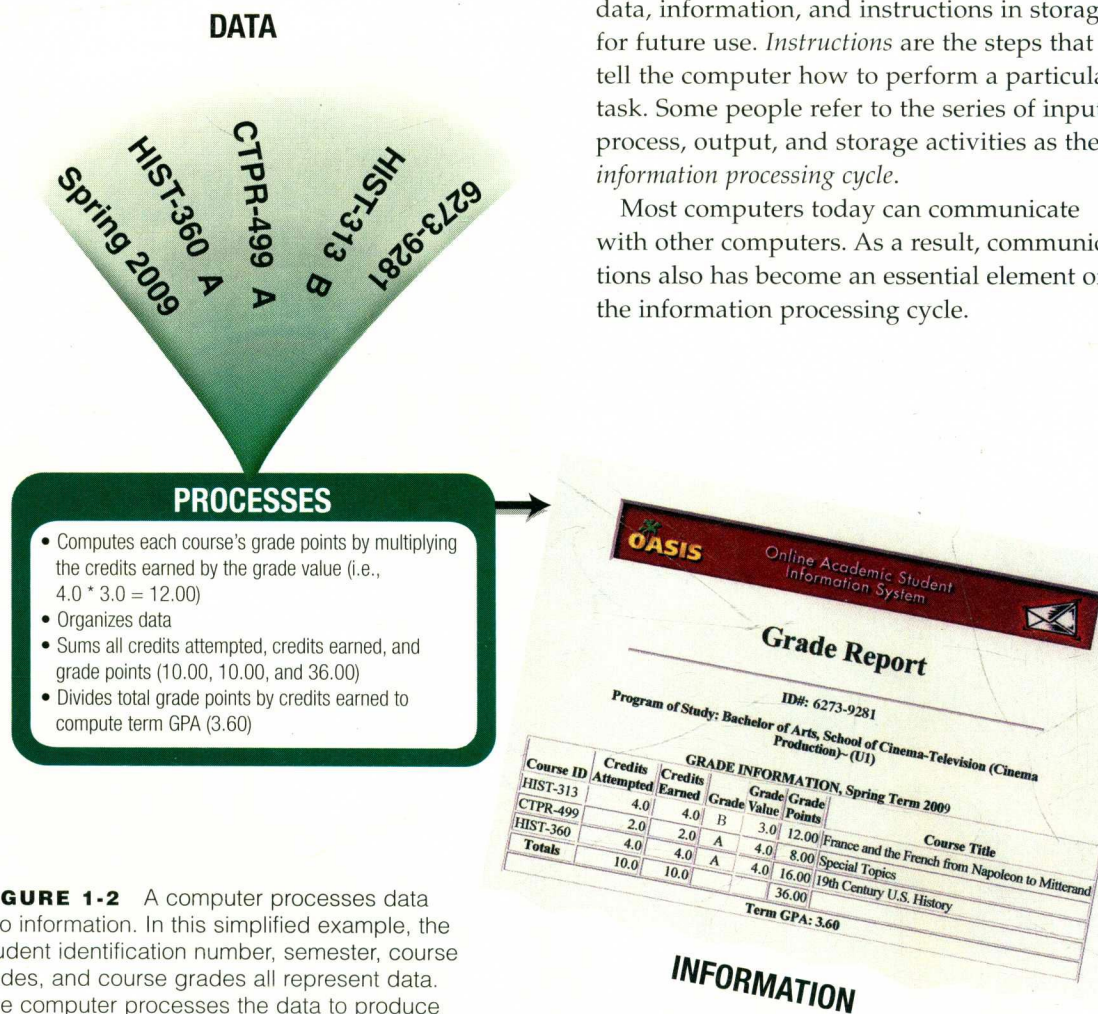


FIGURE 1-2 A computer processes data into information. In this simplified example, the student identification number, semester, course codes, and course grades all represent data. The computer processes the data to produce the grade report (information).

FAQ 1-1

Is data a singular or plural word?

The word data is plural for datum. With respect to computers, however, it is accepted and common practice to use the word data in both the singular and plural context. For more information, visit scsite.com/dc2009/ch1/faq and then click Data.

An **FAQ** (frequently asked question) helps you find answers to commonly asked questions. Web sites often post an FAQ section, and each chapter in this book includes FAQ boxes related to topics in the text.

Information Processing Cycle

Computers process data (input) into information (output). A computer often holds data, information, and instructions in storage for future use. *Instructions* are the steps that tell the computer how to perform a particular task. Some people refer to the series of input, process, output, and storage activities as the *information processing cycle*.

Most computers today can communicate with other computers. As a result, communications also has become an essential element of the information processing cycle.

THE COMPONENTS OF A COMPUTER

A computer contains many electric, electronic, and mechanical components known as **hardware**. These components include input devices, output devices, a system unit, storage devices, and communications devices. Figure 1-3 shows some common computer hardware components.

Input Devices

An **input device** is any hardware component that allows you to enter data and instructions into a computer. Six widely used input devices are the keyboard, mouse, microphone, scanner, digital camera, and Web cam (Figure 1-3).

A computer keyboard contains keys you press to enter data into the computer. For security

purposes, some keyboards have a built-in fingerprint reader, which allows you to work with the computer only if your fingerprint is recognized.

A mouse is a small handheld device. With the mouse, you control movement of a small symbol on the screen, called the pointer, and you make selections from the screen.

A microphone allows you to speak into the computer. A scanner converts printed material (such as text and pictures) into a form the computer can use.

With a digital camera, you take pictures and then transfer them to the computer or printer instead of storing the images on traditional film. A Web cam is a digital video camera that allows you to create movies or take still pictures electronically.



WEB LINK 1-1

Input Devices

For more information, visit scs.site.com/dc2009/ch1/weblink and then click Input Devices.

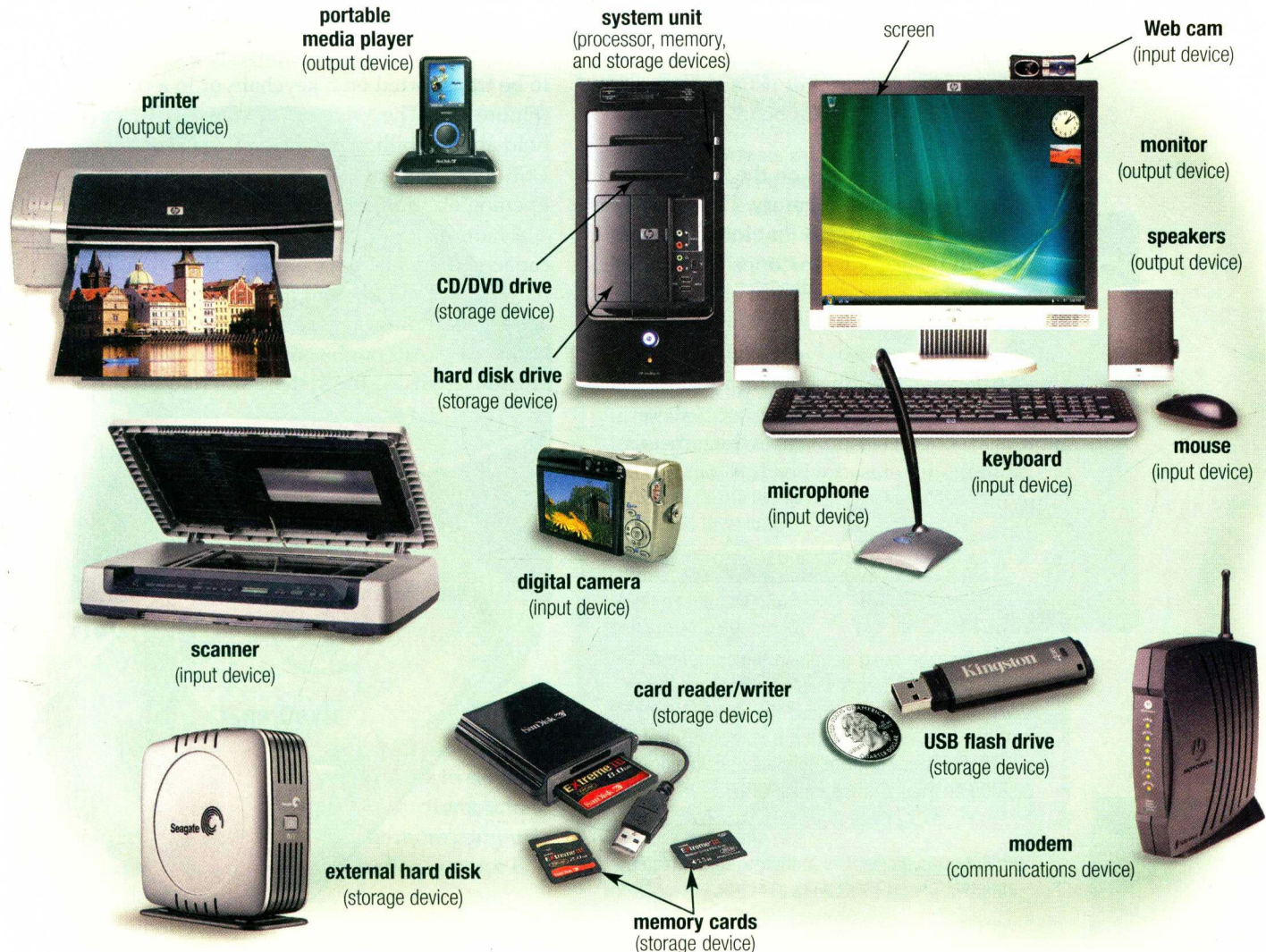


FIGURE 1-3 Common computer hardware components include a keyboard, mouse, microphone, scanner, digital camera, Web cam, printer, monitor, speakers, portable media player, system unit, hard disk drive, external hard disk, USB flash drive, card reader/writer, memory cards, and modem.

Output Devices

An **output device** is any hardware component that conveys information to one or more people. Four commonly used output devices are a printer, a monitor, speakers, and a portable media player (Figure 1-3 on the previous page).

A printer produces text and graphics on a physical medium such as paper. A monitor displays text, graphics, and videos on a screen. Speakers allow you to hear music, voice, and other audio (sounds). You can transfer audio, video, and digital images from a computer to a portable media player and then listen to the audio, watch the video, or view the images on the media player.

System Unit

The **system unit** is a case that contains the electronic components of the computer that are used to process data (Figure 1-3). The circuitry of the system unit usually is part of or is connected to a circuit board called the motherboard.

Two main components on the motherboard are the processor and memory. The *processor* is the electronic component that interprets and carries out the basic instructions that operate the computer. *Memory* consists of electronic components that store instructions waiting to be executed and data needed by those instructions. Although some forms of memory are permanent, most memory keeps data and instructions temporarily, which means its contents are erased when the computer is shut off.



FAQ 1-2

What is a CPU?

The processor. Most people in the computer industry use the terms *CPU* (*central processing unit*) and processor to mean the same. A CPU is not the same as a computer; a computer contains a CPU. For more information, visit scs.site.com/dc2009/ch1/faq and then click CPU.

Storage Devices

Storage holds data, instructions, and information for future use. For example, computers can store hundreds or millions of customer names and addresses. Storage holds these items permanently.

A computer keeps data, instructions, and information on **storage media**. Examples of storage media are USB flash drives, hard disks, CDs, DVDs, and memory cards. A **storage device** records (writes) and/or retrieves (reads) items to and from storage media. Drives and readers/writers, which are types of storage devices (Figure 1-3), accept a specific kind of storage media. For example, a DVD drive (storage device) accepts a DVD (storage media). Storage devices often function as a source of input because they transfer items from storage to memory.

A USB flash drive is a portable storage device that is small and lightweight enough to be transported on a keychain or in a pocket (Figure 1-3). The average USB flash drive can hold about 2 billion characters. You plug a USB flash drive in a special, easily accessible opening on the computer.

A hard disk provides much greater storage capacity than a USB flash drive. The average hard disk can hold more than 320 billion characters. Hard disks are enclosed in an airtight, sealed case. Although some are portable, most are housed inside the system unit (Figure 1-4).



FIGURE 1-4 Hard disks are self-contained devices. The hard disk shown here must be installed in the system unit before it can be used.

Portable hard disks are either external or removable. An external hard disk is a separate, free-standing unit, whereas you insert and remove a removable hard disk from the computer or a device connected to the computer.

A compact disc is a flat, round, portable metal disc with a plastic coating. One type of compact disc is a CD, which can hold from 650 million to 1 billion characters. You can access a CD using most CD and DVD drives (Figure 1-5). Another type of compact disc is a DVD, some of which have enough storage capacity to store two full-length movies or 17 billion characters. To access a DVD, you need a DVD drive.

Some portable devices, such as digital cameras, use memory cards as the storage media. You then can transfer the stored items, such as digital photos, from the memory card to a computer or printer using a card reader/writer (Figure 1-3 on page 7).



FIGURE 1-5 To access a CD or DVD, you need a CD or DVD drive.

Communications Devices

A **communications device** is a hardware component that enables a computer to send (transmit) and receive data, instructions, and information to and from one or more computers. A widely used communications device is a modem (Figure 1-3).

Communications occur over cables, telephone lines, cellular radio networks, satellites, and other transmission media. Some transmission media, such as satellites and cellular radio networks, are wireless, which means they have no physical lines or wires.

ADVANTAGES AND DISADVANTAGES OF USING COMPUTERS

Society has reaped many benefits from using computers. Both business and home users can make well-informed decisions because they have instant access to information from anywhere in the world. A **user** is anyone who communicates with a computer or utilizes the information it generates. Students, another type of user, have more tools to assist them in the learning process. Read Looking Ahead 1-1 for a look at the next generation of benefits from using computers.



LOOKING AHEAD 1-1

Paying by Cell Phone

Fumbling for spare change at a vending machine or swiping your credit card at the checkout lane may be eliminated with upcoming contactless, or proximity, payments using a cell phone. By waving your phone in front of a merchant's wireless receiver, your credit or debit transactions can be completed in seconds.

Contactless payments use a radio frequency to transmit account information from a chip embedded in the phone to the merchant's receiver. In test studies, consumers using the proximity payments have decreased their time waiting in line and increased the amount spent as much as 30 percent as compared to using cash.

Security issues have been addressed in the test systems. For example, the transaction would be initiated only when entering a password or PIN (personal identification number) on the phone. Also, the cell phone must touch or pass within a few inches of the receiver in order to complete the wireless payment.

For more information, visit scsite.com/dc2009/ch1/looking and then click Cell Phone Payments.



WEB LINK 1-3

Communications Devices

For more information, visit scsite.com/dc2009/ch1/weblink and then click Communications Devices.

ADVANTAGES OF USING COMPUTERS Benefits of computers are possible because computers have the advantages of speed, reliability, consistency, storage, and communications.

- **Speed:** When data, instructions, and information flow along electronic circuits in a computer, they travel at incredibly fast speeds. Many computers process billions or trillions of operations in a single second. Processing involves computing (adding, subtracting, etc.), sorting (e.g., alphabetizing), organizing, displaying pictures, recording audio clips, playing music, and showing a movie or video. For a technical discussion about how computers process data, read the High-Tech Talk article on page 38.
- **Reliability:** The electronic components in modern computers are dependable and reliable because they rarely break or fail.
- **Consistency:** Given the same input and processes, a computer will produce the same results — consistently. A computing phrase — known as *garbage in, garbage out* — points out that the accuracy of a computer's output depends on the accuracy of the input. For example, if you do not use the flash on a digital camera when indoors, the resulting pictures that are displayed on the computer screen may be unusable because they are too dark.
- **Storage:** A computer can transfer data quickly from storage to memory, process it, and then store it again for future use. Many computers store enormous amounts of data and make this data available for processing anytime it is needed.
- **Communications:** Most computers today can communicate with other computers, often wirelessly. Computers with this capability can

share any of the four information processing cycle operations — input, process, output, and storage — with another computer or a user.

DISADVANTAGES OF USING COMPUTERS Some disadvantages of computers relate to the violation of privacy, public safety, the impact on the labor force, health risks, and the impact on the environment.

- **Violation of Privacy:** Nearly every life event is stored in a computer somewhere...in medical records, credit reports, tax records, etc. In many instances, where personal and confidential records were not protected properly, individuals have found their privacy violated and identities stolen.
- **Public Safety:** Adults, teens, and children around the world are using computers to share publicly their photos, videos, journals, music, and other personal information. Some of these unsuspecting, innocent computer users have fallen victim to crimes committed by dangerous strangers. Protect yourself and your dependents from these criminals by being cautious. For example, do not share information that would allow others to identify or locate you. Read Ethics & Issues 1-1 for a related discussion.
- **Impact on Labor Force:** Although computers have improved productivity in many ways and created an entire industry with hundreds of thousands of new jobs, the skills of millions of employees have been replaced by computers. Thus, it is crucial that workers keep their education up-to-date. A separate impact on the labor force is that some companies are outsourcing jobs to foreign countries instead of keeping their homeland labor force employed.



ETHICS & ISSUES 1-1

Who Should Look Out for the Safety of Computer Users?

In recent years, computer usage by teens and young adults exploded as a new means of communicating and socializing. Not surprisingly, the problems associated with this exciting way to interact with others mirror some problems in society in general. Problems include bullying, smear campaigns against individuals, and inappropriate contact between adults and minors. Recently, a high-school-aged girl secretly left the country with the intent of marrying an adult in the foreign country whom she met on the Internet. Fortunately, authorities in the foreign country intercepted her at the airport and sent her home. Some parents claim that the government should intervene to ensure better monitoring of inappropriate behavior. While some private companies have stepped up monitoring, they often claim that they are not responsible for the behavior of individuals, and parents and individuals should be responsible for inappropriate actions. Many teens and young adults feel that the problems are simply a matter of personal responsibility and following some simple guidelines, such as the "golden rule." Should the companies that provide the service to teens and young adults be required to monitor and stop inappropriate or socially unacceptable behavior? Why or why not? What role should parents play in overseeing their child's involvement in computer use? Why? Should police or other government authorities be responsible for maintaining order in this situation in the same way they are charged with maintaining order in society in general? Why or why not?

- **Health Risks:** Prolonged or improper computer use can lead to injuries or disorders of the hands, wrists, elbows, eyes, neck, and back. Computer users can protect themselves from these health risks through proper workplace design, good posture while at the computer, and appropriately spaced work breaks. Another health risk, called computer addiction, occurs when someone becomes obsessed with using the computer. Once recognized, computer addiction is a treatable disorder.
- **Impact on Environment:** Computer manufacturing processes and computer waste are depleting natural resources and polluting the environment. When computers are discarded in landfills, they release toxic materials and potentially dangerous levels of lead, mercury, and flame retardants. Strategies that can help protect the environment include recycling, regulating manufacturing processes, extending the life of computers, and immediately donating replaced computers. When you purchase a new computer, some retailers offer to dispose of your old computer properly.

Test your knowledge of pages 4 through 11 in Quiz Yourself 1-1.



QUIZ YOURSELF 1-1

Instructions: Find the true statement below. Then, rewrite the remaining false statements so they are true.

1. A computer is a motorized device that processes output into input.
2. A storage device records (reads) and/or retrieves (writes) items to and from storage media.
3. An output device is any hardware component that allows you to enter data and instructions into a computer.
4. Computer literacy involves having a current knowledge and understanding of computers and their uses.
5. Computers have the disadvantages of fast speeds, high failure rates, producing consistent results, storing small amounts of data, and communicating with others.
6. Four commonly used input devices are a printer, a monitor, speakers, and a portable media player.

Quiz Yourself Online: To further check your knowledge of computer literacy, computers and their components, and the advantages and disadvantages of computers, visit scs.site.com/dc2009/ch1/quiz and then click Objectives 1 – 4.

NETWORKS AND THE INTERNET

A **network** is a collection of computers and devices connected together, often wirelessly, via communications devices and transmission media. When a computer connects to a network, it is **online**.

Networks allow computers to share *resources*, such as hardware, software, data, and information. Sharing resources saves time and money. In many networks, one or more computers act as a server. The server controls access to the resources on a network. The other computers on the network, each called a client or workstation, request resources from the server (Figure 1-6). The major differences between the server and client computers are that the server ordinarily has more power, more storage space, and expanded communications capabilities.

Many homes and most businesses and schools network their computers and devices. Most allow users to connect their computers wirelessly to the network. Home networks usually are small, existing within a single structure. Business and school networks can be small, such as in a room or building, or widespread, connecting computers across a city, country, or the globe. The world's largest computer network is the Internet.

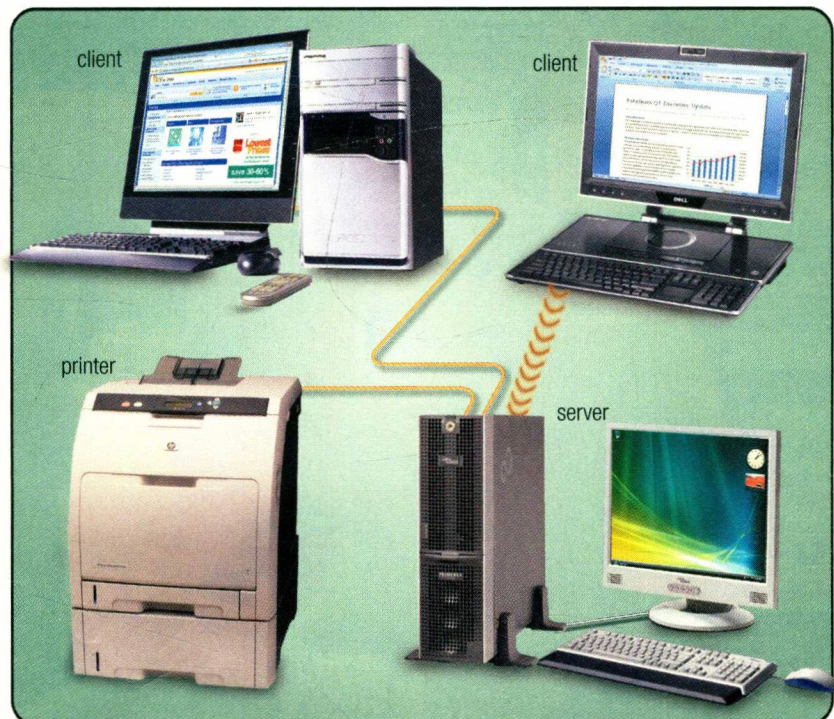


FIGURE 1-6 A server manages the resources on a network, and clients access the resources on the server. This network enables three separate computers to share the same printer, one wirelessly.

The Internet

The **Internet** is a worldwide collection of networks that connects millions of businesses, government agencies, educational institutions, and individuals (Figure 1-7).

More than one billion people around the world use the Internet daily for a variety of reasons, including the following:

- Communicate with and meet other people
- Conduct research and access a wealth of information and news
- Shop for goods and services
- Bank and invest
- Take a class
- Access sources of entertainment and leisure, such as travel directories, online games, music, videos, books, and magazines
- Download music and video
- Share information, photos, and videos

Figure 1-8 shows examples in each of these areas.

People connect to the Internet to exchange information with others around the world. E-mail allows you to send messages to other users. With instant messaging, you can have a live conversation with another connected user. In a chat room, you can communicate with

multiple users at the same time — much like a group discussion. You also can use the Internet to make a telephone call.

Businesses, called access providers, offer users and companies access to the Internet free or for a fee. By subscribing to an access provider, you can use your computer and a communications device, such as a modem, to connect to the many services of the Internet.

The Web, short for World Wide Web, is one of the more popular services on the Internet. Think of the Web as a global library of information available to anyone connected to the Internet. The **Web** contains billions of documents called Web pages. A **Web page** can contain text, graphics, audio, and video. The eight screens shown in Figure 1-8 are examples of Web pages. Web pages often have built-in connections, or links, to other documents, graphics, other Web pages, or Web sites. A Web site is a collection of related Web pages. Some Web sites allow users to access music and videos that can be downloaded, or transferred to storage media in a computer or portable media player, and then listen to the music through speakers, headphones, or earphones, or view the videos on a display device.

WEB LINK 1-4

The Internet

For more information, visit scsite.com/dc2009/ch1/weblink and then click The Internet.



FIGURE 1-7

The Internet is the largest computer network, connecting millions of computers around the world.



FIGURE 1-8 Users access the Internet for a variety of reasons.

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