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DISCOVERING COMPUTERS 2018

Digital Technology, Data, and Devices

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DISCOVERING COMPUTERS 2018

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Discovering Computers: Digital Technology, Data, and Devices
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DISCOVERING COMPUTERS 2018

Digital Technology, Data, and Devices

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Digital Technology, Data, and Devices

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Introducing Today's Technologies: Computers, Devices, and the Web

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OBJECTIVES

After completing this module, you will be able to:

1. Differentiate among laptops, tablets, desktops, and servers
2. Describe the purpose and uses of smartphones, digital cameras, portable and digital media players, e-book readers, wearable devices, and game devices
3. Describe the relationship between data and information
4. Briefly explain various input options (keyboards, pointing devices, voice and video input, and scanners), output options (printers, displays, and speakers), and storage options (hard disks, solid-state drives, USB flash drives, memory cards, optical discs, and cloud storage)
5. Differentiate the web from the Internet, and describe the relationship among the web, webpages, websites, and web servers
6. Explain the purpose of a browser, a search engine, and an online social network
7. Briefly describe digital security risks associated with viruses and other malware, privacy, your health, and the environment
8. Differentiate between an operating system and applications
9. Differentiate between wired and wireless network technologies, and identify reasons individuals and businesses use networks
10. Discuss how society uses technology in education, government, finance, retail, entertainment, health care, science, travel, publishing, and manufacturing
11. Identify technology used by home users, small/home office users, mobile users, power users, and enterprise users

Today's Technology

In the course of a day, you may ... complete a homework assignment and watch a streaming video using your laptop, flip through news headlines and make dinner reservations using your tablet, search for directions and the local weather forecast while listening to music on your smartphone, edit a video on a desktop computer, and share photos online from your digital camera with family and friends. These and many other technologies are an integral part of everyday life: at school, at home, and at work (Figure 1-1).

Technology can enable you to more efficiently and effectively access and search for information; share personal ideas, photos, and videos with friends, family, and others; communicate with and meet other people; manage finances; shop for goods and services; play games or access other sources of entertainment; keep your life and activities organized; and conduct business activities. People who can accomplish these types of tasks using technology often are said to be tech savvy.

Figure 1-1 People use a variety of computers, mobile devices, and apps every day.
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Because technology changes, you must keep up with the changes to remain digitally literate. *Digital literacy* involves having a current knowledge and understanding of computers, mobile devices, the web, and related technologies. This book presents the knowledge you need to be digitally literate today.

As you read this first module, keep in mind it is an overview. Most of the terms and concepts introduced in this module will be discussed in more depth later in the book.

Computers

A **computer** is an electronic device, operating under the control of instructions stored in its own memory, that can accept data (*input*), process the data according to specified rules, produce information (*output*), and store the information for future use (Figure 1-2). Computers contain many electric, electronic, and mechanical components known as *hardware*.

Figure 1-2 A laptop is a widely used type of computer.
mama_mia / Shutterstock.com

Electronic components in computers process data using instructions, which are the steps that tell the computer how to perform a particular task. A collection of related instructions organized for a common purpose is referred to as software or a program. Using software, you can complete a variety of activities, such as search for information, type a paper, balance a budget, create a presentation, or play a game.

One popular category of computer is the personal computer. A *personal computer* (PC) is a computer that can perform all of its input, processing, output, and storage activities by itself and is intended to be used by one person at a time. Most personal computers today also can communicate with other computers and devices.

Types of personal computers include laptops, tablets, and desktops, with the first two sometimes called mobile computers. A *mobile computer* is a portable personal computer, designed so that a user can carry it from place to place. A *user* is anyone who interacts with a computer or mobile device, or utilizes the information it generates.

Laptops

A **laptop**, also called a *notebook computer*, is a thin, lightweight mobile computer with a screen in its lid and a keyboard in its base (shown in Figure 1-2). Designed to fit on your lap and for easy transport, most laptops weigh up to 7 pounds (varying by manufacturer and specifications). A laptop that is less than one inch thick and weighs about three pounds or less sometimes is referred to as an ultrathin laptop. Most laptops can operate on batteries or a power supply or both.

Tablets

Usually smaller than a laptop but larger than a phone, a **tablet** is a thin, lighter-weight mobile computer that has a touch screen (read How To 1-1 for ways to interact with a touch screen). A popular style of tablet is the slate, which does not contain a physical keyboard (Figure 1-3). Like laptops, tablets run on batteries or a power supply or both; however, batteries in a tablet typically last longer than those in laptops.

Figure 1-3 A slate tablet.
Denys Prykhodov / Shutterstock.com

CONSIDER THIS

If a slate tablet has no keyboard, how do you type on it?

You can use your fingers to press keys on a keyboard that appears on the screen, called an on-screen keyboard, or you can purchase a separate physical keyboard that attaches to or wirelessly communicates with the tablet. You also may be able to speak into the tablet, and your spoken words will translate to typed text.

HOW TO 1-1

Interact with a Touch Screen

You usually can interact with a touch screen using gestures. A *gesture* is a motion you make on a touch screen with the tip of one or more fingers or your hand. Touch screens are convenient because they do not require a separate device for input. Tablets and smartphones typically have touch screens.

The table below presents common ways to interact with a touch screen.

Touch Screen Gestures

Motion	Description	Common Uses
Tap 	Quickly touch and release one finger one time	Activate a link (built-in connection) Press a button Run a program or app
Double-tap 	Quickly touch and release one finger two times	Run a program or app Zoom in (show a smaller area on the screen, so that contents appear larger) at the location of the double-tap
Press and hold 	Press and hold one finger to cause an action to occur, or until an action occurs	Display a shortcut menu (immediate access to allowable actions) Activate a mode enabling you to move an item with one finger to a new location
Drag, or slide 	Press and hold one finger on an object and then move the finger to the new location	Move an item around the screen Scroll
Swipe 	Press and hold one finger and then move the finger horizontally or vertically on the screen	Scroll Display a bar that contains commands on an edge of the screen
Stretch 	Move two fingers apart	Zoom in (show a smaller area on the screen, so that contents appear larger)
Pinch 	Move two fingers together	Zoom out (show a larger area on the screen, so that contents appear smaller)

Consider This: In addition to the motions listed in the table, what other motions do you think a touch screen should support?

Desktops and All-in-Ones

A **desktop**, or desktop computer, is a personal computer designed to be in a stationary location, where all of its components fit on or under a desk or table. On many desktops, the screen is housed in a display device (or simply display) that is separate from a tower, which is a case that contains the processing circuitry (Figure 1-4a). Another type of desktop called an **all-in-one** does not contain a tower and instead uses the same case to house the display and the processing circuitry (Figure 1-4b). Some desktops and all-in-ones have displays that support touch.

BTW
Desktop
The term, desktop, also sometimes is used to refer to an on-screen work area on laptops, tablets, and desktops.

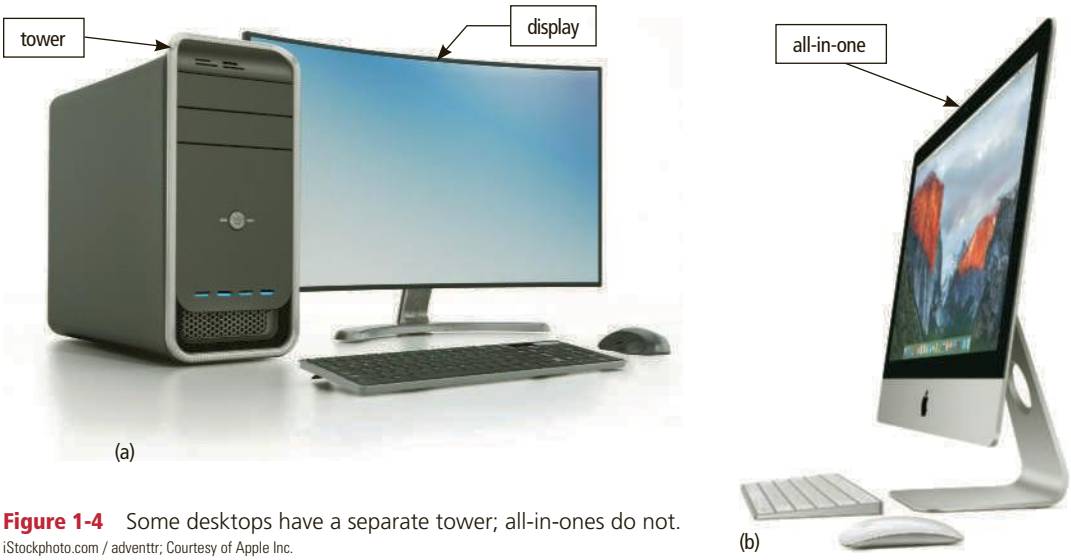

Figure 1-4 Some desktops have a separate tower; all-in-ones do not.
iStockphoto.com / adventtr; Courtesy of Apple Inc.

CONSIDER THIS

Which type of computer — laptop, tablet, or desktop — is best?
It depends on your needs. Because laptops can be as powerful as the average desktop, more people today choose laptops over desktops so that they have the added benefit of portability. Tablets are ideal for those not needing the power of a laptop or for searching for information, communicating with others, and taking notes in lectures, at meetings, conferences, and other forums where a laptop is not practical. Desktops and all-in-ones often have larger displays than laptops or tablets, which make them well suited for developing software, editing large documents, or creating images and videos.

Servers

A **server** is a computer dedicated to providing one or more services to other computers or devices on a network. A **network** is a collection of computers and devices connected together, often wirelessly. Services provided by servers include storing content and controlling access to hardware, software, and other resources on a network.

BTW
Online
When a computer or device connects to a network, it is said to be online.

A server can support from two to several thousand connected computers and devices at the same time. Servers are available in a variety of sizes and types for both small and large business applications (Figure 1-5). Smaller applications, such as at home, sometimes use a high-end desktop as a server. Larger corporate, government, and web applications use powerful, expensive servers to support their daily operations.

Figure 1-5 A server provides services to other computers or devices on a network.
iStockphoto.com / GuidoVrola

Mobile and Game Devices

A *mobile device* is a computing device small enough to hold in your hand. Because of their reduced size, the screens on mobile devices are small — often between 3 and 5 inches.

Figure 1-6 Most smartphones have a touch screen.
iStockphoto.com / cincila

Some mobile devices are Internet capable, meaning that they can connect to the Internet wirelessly. You often can exchange information between the Internet and a mobile device or between a computer or network and a mobile device. Popular types of mobile devices are smartphones, digital cameras, portable and digital media players, e-book readers, and wearable devices.

CONSIDER THIS

Are mobile devices computers?
The mobile devices discussed in this section can be categorized as computers because they operate under the control of instructions stored in their own memory, can accept data, process the data according to specified rules, produce or display information, and store the information for future use.

Smartphones

A **smartphone** is an Internet-capable phone that usually also includes a calendar, an address book, a calculator, a notepad, games, and several other apps (which are programs on the smartphone). Other apps are available through an app store that typically is associated with the phone.

Smartphones typically communicate wirelessly with other devices or computers. With most smartphone models, you also can listen to music, take photos, and record videos. Most smartphones have a touch screen (Figure 1-6). A few models have built-in mini keyboards or keypads that contain both numbers and letters.

Instead of calling someone's phone to talk, you can send messages to others by pressing images of keys and icons on an on-screen keyboard on the phone. Four popular types of messages that you can send with smartphones include voice messages, text messages, picture messages, and video messages.

- A *voice mail message* is a short audio recording sent to or from a smartphone or other mobile device.
- A *text message* is a short note, typically fewer than 300 characters, sent to or from a smartphone or other mobile device.
- A *picture message* is a photo or other image, sometimes along with sound and text, sent to or from a smartphone or other mobile device.
- A *video message* is a short video clip, usually about 30 seconds, sent to or from a smartphone or other mobile device.

Read Ethics & Issues 1-1 to consider whether it should be legal to use a hands-free device, such as a smartphone, while driving.

BTW

Messaging Services
Mobile service providers may charge additional fees for sending text, picture, or video messages, depending on the messaging plan.

ETHICS & ISSUES 1-1

Should It Be Legal to Use a Hands-Free Device while Driving?
Your new vehicle includes a sophisticated hands-free system that enables you to connect a mobile device to the vehicle's sound system. In addition to making phone calls without holding your device, you also can use this technology to read and respond to text messages or to update your Facebook status using speech-to-text, which converts your spoken words to text. Is this technology safe to use?

The debate about hands-free device safety elicits different points of view from vehicle insurance companies, consumer safety groups, and the telecommunications industry. AAA (American Automobile Association) conducted a study to measure the mental effect of using hands-free devices while driving. The conclusions indicated that drivers using hands-free devices are distracted, miss visual clues, and have slower reaction times. Others claim that drivers can be just as easily distracted if they are discussing business or emotional matters with passengers in the vehicle. The National Highway Traffic Safety Administration estimates that more than 3,000 fatalities occur each year due to "distracted driving."

Some states have outlawed any use of mobile phones while driving, while others ban users from sending text messages and/or require drivers to use hands-free devices while driving. Some vehicles contain technology that can restrict or block mobile phone usage while the vehicle is in motion.

Consider This: Do you believe you are distracted if you use hands-free devices while driving? Why or why not? Do you think auto manufacturers should continue to include hands-free device technology in vehicles? Why or why not? Would you use in-vehicle technology that limited your device usage while driving?

Digital Cameras

A **digital camera** is a device that allows you to take photos and store the photographed images digitally (Figure 1-7). A smart digital camera also can communicate wirelessly with other devices and include apps similar to those on a smartphone. Many mobile computers and devices, such as tablets and smartphones, include at least one integrated digital camera.

Digital cameras typically allow you to review, and sometimes modify, images while they are in the camera. You also can transfer images from a digital camera to a computer or device, so that you can review, modify, share, organize, or print the images. Digital cameras often can connect to or communicate wirelessly with a computer, a Smart TV (discussed later in the module), a printer, or the Internet, enabling you to access the photos on the camera without using a cable. Some also can record videos. Many digital cameras also have built-in GPS (discussed later in this module), giving them the capability to record the exact location where a photo was taken and store these details with the photo.

Figure 1-7 With a digital camera, you can view photographed images immediately through a small screen on the camera to see if the photo is worth keeping.
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Portable and Digital Media Players

A **portable media player** is a mobile device on which you can store, organize, and play or view digital media (Figure 1-8). *Digital media* includes music, photos, and videos. Thus, portable media players enable you to listen to music, view photos, and watch videos, movies, and television shows. With most, you transfer the digital media from a computer or the web, if the device is Internet capable, to the portable media player. Some enable you to play the media while it streams, that is, while it transfers to the player.

Portable media players usually require a set of *earbuds*, which are small speakers that rest inside each ear canal. Some portable media player models have a touch screen, while others have a pad that you operate with a thumb or finger, so that you can navigate through digital media, adjust volume, and customize settings. Some portable media players also offer a calendar, address book, games, and other apps (discussed later in this module).

Portable media players are a mobile type of digital media player. A *digital media player* or *streaming media player* is a device, typically used in a home, that streams digital media from a computer or network to a television, projector, or some other entertainment device.

Figure 1-8 Portable media players typically include a set of earbuds. Digital media players stream media to a home entertainment device.
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E-Book Readers

An **e-book reader** (short for electronic book reader), or *e-reader*, is a mobile device that is used primarily for reading e-books (Figure 1-9). An *e-book*, or digital book, is an electronic version of a printed book, readable on computers and other digital devices. In addition to books, you typically can purchase and read other forms of digital media such as newspapers and magazines.

Most e-book reader models have a touch screen, and some are Internet capable. These devices usually are smaller than tablets but larger than smartphones.

Figure 1-9 An e-book reader.
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Wearable Devices

A **wearable device** or *wearable* is a small, mobile computing consumer device designed to be worn (Figure 1-10). These devices often communicate with a mobile device or computer.

Two popular wearable devices are activity trackers and smartwatches. Activity trackers monitor heart rate, measure pulse, count steps, and track sleep patterns. In addition to keeping time, a smartwatch can communicate with a smartphone to make and answer phone calls, read and send messages, access the web, play music, work with apps, such as fitness trackers and GPS, and more.

Figure 1-10 Activity trackers and smartwatches are popular types of wearable devices.
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Game Devices

A **game console** is a mobile computing device designed for single-player or multiplayer video games. Gamers often connect the game console to a television so that they can view their game-play on the television's screen (Figure 1-11). Many game console models are Internet capable and also allow you to listen to music and watch movies or view photos. Typically weighing between three and eleven pounds, the compact size of game consoles makes them easy to use at home, in the car, in a hotel, or any location that has an electrical outlet and a television screen.

Figure 1-11 Game consoles often connect to a television; handheld game devices contain a built-in screen.
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A handheld game device is small enough to fit in one hand, making it more portable than the game console. Because of their reduced size, the screens are small — similar in size to some smartphone screens. Some handheld game device models are Internet capable and also can communicate wirelessly with other similar devices for multiplayer gaming.

CONSIDER THIS

Are digital cameras, portable media players, e-book readers, and handheld game devices becoming obsolete as more and more smartphones and tablets include their functionality?

Many smartphones and tablets enable you to take and store photos; store, organize, and play or view your digital media; read e-books; and play games. This trend of computers and devices with technologies that overlap, called **digital device convergence**, means that consumers may need fewer devices for the functionality that they require.

Still, consumers may purchase separate stand-alone devices (i.e., a separate digital camera, portable media player, etc.) for a variety of reasons. The stand-alone device (i.e., a digital camera) may have more features and functionality than the combined device offers (i.e., a smartphone). You might want to be able to use both devices at the same time; for example, you might send text messages on the phone while reading a book on an e-book reader. Or, you might want protection if your combined device (i.e., smartphone) breaks. For example, you still can listen to music on a portable media player if your smartphone becomes nonfunctional.

Tech Feature 1-1: Gaming and Digital Home

Technology has made homes entertaining, efficient, and safe. Read Tech Feature 1-1 to learn how game devices provide entertainment and education, and home automation offers convenience and significant cost savings.

TECH FEATURE 1-1

Gaming and Digital Home

Academic researchers developed the first video games in the 1950s as part of their studies of artificial intelligence and simulations, and their work was applied and expanded commercially to early home consoles and arcade games. The concept of home automation can be traced back to 1898 when Nikola Tesla invented the first remote control. The following sections describe how these two technologies are used today.

Gaming

Video gamers spend billions of dollars each year making the most of their downtime with game consoles and devices. An estimated 1.2 billion people worldwide are active video gamers, half of whom play at least 2 hours per day. The popularity is due, in large part, to the social aspect of gathering families and friends to play together as a group or online with one another and those around the world. The wide variety of categories offers a gaming experience for practically everyone in genres such as adventure, education, fitness, puzzles, sports, role-playing, and simulation.

- **Obtaining Games:** Gamers have several options available for obtaining games. For tablets and smartphones, they can download games from an app store to a mobile computer or device. For game consoles, they can purchase or rent discs or other media that contain games, download or transfer them from online stores, or sign up for cloud services that stream or transfer games on demand.
- **Accessories and Input Techniques:** The more popular game consoles work with a wide variety of accessories and input techniques for directing movements and actions of on-screen players and objects. They include gamepads, voice commands, and fitness accessories, some of which are shown here. Although many games are played using a controller, several game consoles operate by allowing the player to be the controller.

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Home Automation

New home builders and existing homeowners are integrating features that automate a wide variety of tasks, save time and money, and enhance the overall at-home environment.

(continued)

- **Lighting:** Controlling lighting is one of the more common uses of technology in the home. Remotes turn light fixtures on and off, and motion sensors turn on lights when a car or a visitor approaches the driveway or walkway.
- **Thermostats:** Programmable thermostats adjust to seasonal needs and can be set to control temperatures in individual rooms. Homeowners can use their smartphones to monitor heating and cooling systems, adjust temperatures, and manage energy consumption.
- **Appliances:** Smart appliances, such as dishwashers, can be programmed to run at nonpeak electrical times. Coffeemakers can turn on at set times and shut off if an overheating coffeepot has been left on accidentally. Refrigerators can track expiration dates and create shopping lists.
- **Security:** Security systems can detect break-ins at doors and heat from fires, and they can send text and email messages to alert a homeowner when someone has entered or left the home. Surveillance cameras keep a watchful eye on the premises and interior rooms; homeowners can view the images on televisions and computers within the house or on a webpage when they are away from home.
- **Remotes:** Many people are turning to using their smartphones and tablets to control all the devices in the room. Users enjoy the convenience of customizing apps to operate their television, DVR, and security system and to perform other functions anywhere in the home.

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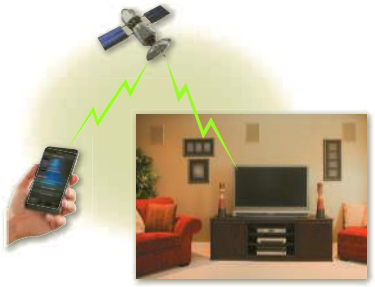

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Consider This: How has your life become more efficient, safe, and enjoyable by using home automation and entertainment features? Why do you think gaming is so popular? Can you think of any downsides?

Data and Information

Computers process data (input) into information (output) and often store the data and resulting information for future use. *Data* is a collection of unprocessed items, which can include text, numbers, images, audio, and video. *Information* conveys meaning to users. Both business and home users can make well-informed decisions because they have instant access to information from anywhere in the world.

Many daily activities either involve the use of or depend on information from a computer. For example, as shown in Figure 1-12, computers process several data items to print information in the form of a cash register receipt.

BTW

Mobile Computer Input

If you prefer a full-sized keyboard to a laptop's keyboard or a tablet's on-screen keyboard, you can use a full-sized keyboard with your mobile computer. Likewise, if you prefer using a mouse instead of a touchpad, you can use a mouse with your mobile computer.

CONSIDER THIS

What is another example of data and its corresponding information?

Your name, address, term, course names, course sections, course grades, and course credits all represent data that is processed to generate your semester grade report. Other information on the grade report includes results of calculations, such as total semester hours, grade point average, and total credits.

Input

Users have a variety of input options for entering data into a computer, many of which involve using an input device. An **input device** is any hardware component that allows you to enter data and instructions into a computer or mobile device. The following sections discuss common input methods.

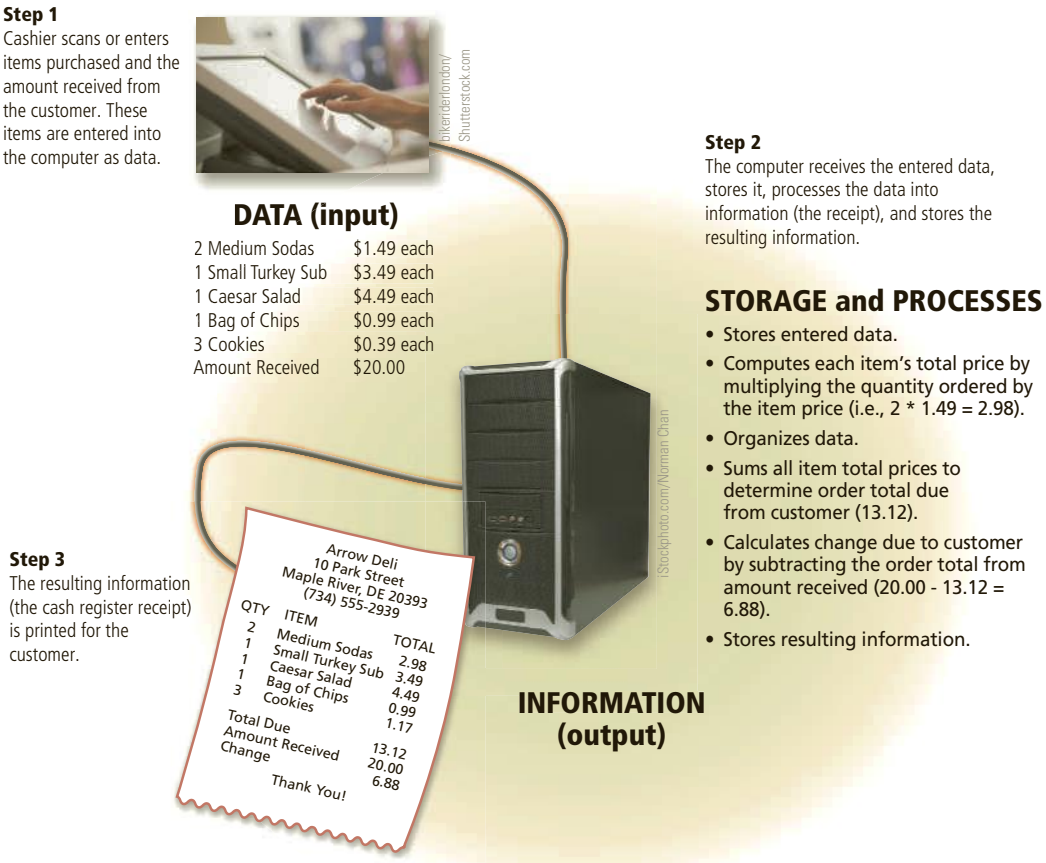

Figure 1-12 A computer processes data into information. In this simplified example, the item ordered, item price, quantity ordered, and amount received all represent data (input). The computer processes the data to produce the cash register receipt (information, or output).

Keyboards A *keyboard* contains keys you press to enter data and instructions into a computer or mobile device (Figure 1-13). All desktop keyboards have a typing area that includes letters of the alphabet, numbers, punctuation marks, and other basic keys. Some users prefer a wireless keyboard because it eliminates the clutter of a cord.

Keyboards for desktops contain more keys than keyboards on mobile computers and devices. To provide the same functionality as a desktop keyboard, many of the keys on mobile computers and devices serve two or three purposes. On a laptop, for example, you often use the same keys to type numbers and to show various areas on a screen, switching a key's purpose by pressing a separate key first.

Instead of a physical keyboard, users also can enter data via an on-screen keyboard or a virtual keyboard, which is a keyboard that projects from a device to a flat surface.

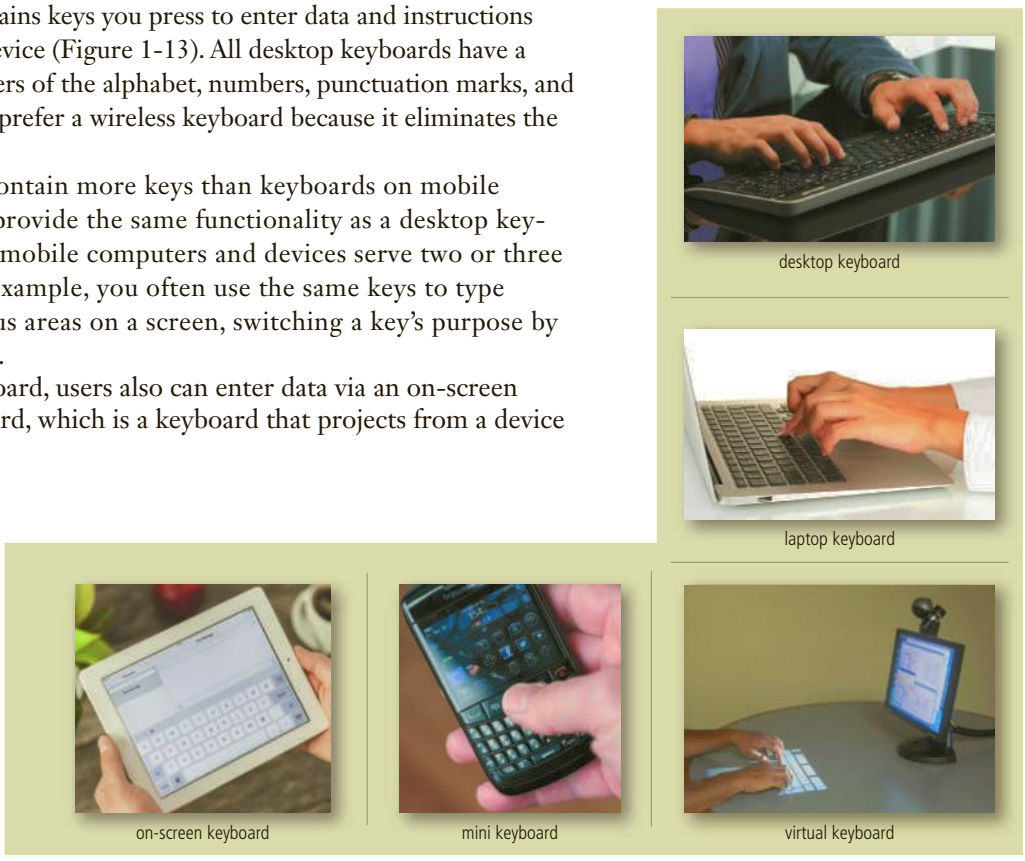

Figure 1-13 Users have a variety of options for entering typed text.

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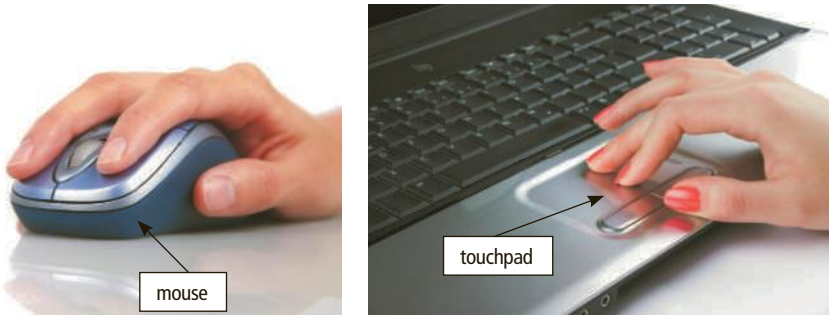


Figure 1-14 A mouse and a touchpad.
iStockphoto.com / PhotoTalk; iStockphoto.com / deepblue4you

Pointing Devices A pointing device is an input device that allows a user to control a small symbol on a screen, called the pointer. Desktops typically use a mouse as their pointing device, and laptops use a touchpad (Figure 1-14).

A *mouse* is a pointing device that fits under the palm of your hand comfortably. With the mouse, you control movement of the pointer and send instructions to the computer or mobile device. Table 1-1 identifies some of the common mouse operations. Like keyboards, some users prefer working with a wireless mouse.

A *touchpad* is a small, flat, rectangular pointing device that is sensitive to pressure and motion. To control the pointer with a touchpad, slide your fingertip across the surface of the pad. On most touchpads, you also can tap the pad's surface to imitate mouse operations, such as clicking.

Table 1-1 Mouse Operations

Operation	Description	Common Uses
Point	Move the mouse until the pointer is positioned on the item of choice.	Position the pointer on the screen.
Click	Press and release the primary mouse button, which usually is the left mouse button.	Select or deselect items on the screen or run a program or feature.
Right-click	Press and release the secondary mouse button, which usually is the right mouse button.	Display a shortcut menu.
Double-click	Quickly press and release the primary mouse button twice without moving the mouse.	Run a program or program feature.
Drag	Point to an item, hold down the primary mouse button, move the item to the desired location on the screen, and then release the mouse button.	Move an object from one location to another or draw pictures.

Voice and Video Input Some mobile devices and computers enable you to speak data instructions using voice input and to capture live full-motion images using video input. With your smartphone, for example, you may be able to use your voice to send a text message, schedule an appointment, and dial a phone number. Or, you may opt for video calling instead of a voice phone call, so that you and the person you called can see each other as you chat on a computer or mobile device. As in this example, video input usually works in conjunction with voice input. For voice input, you use a microphone, and for video input you use a webcam (Figure 1-15).

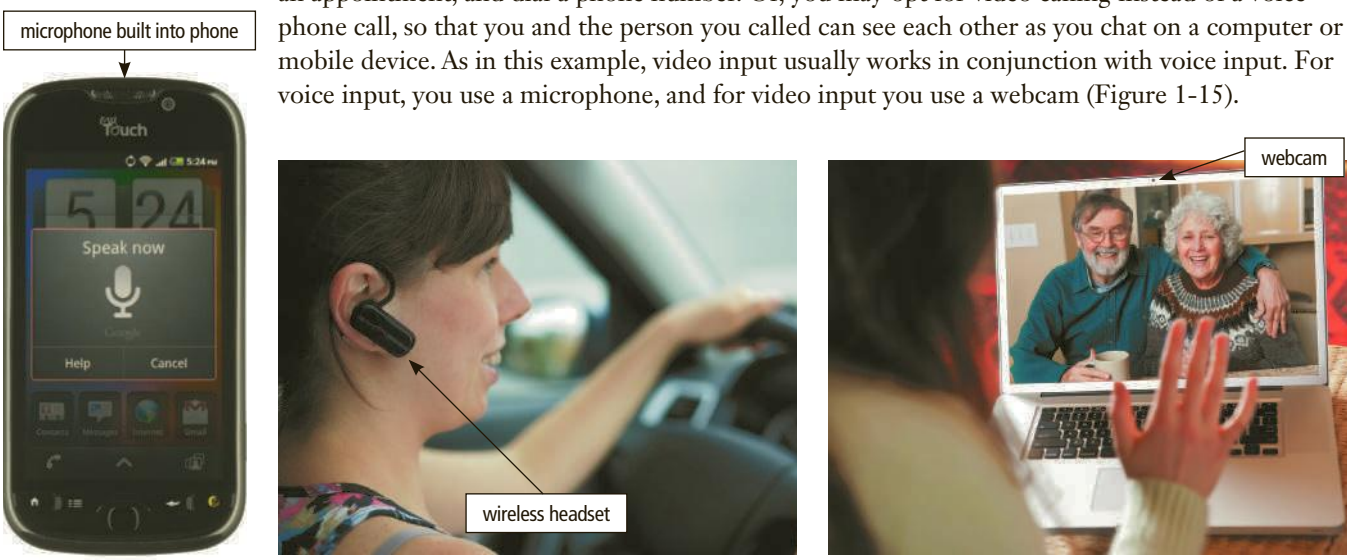


Figure 1-15 You can speak instructions into a microphone or wireless headset and capture live video on a webcam for a video call.
iStockphoto.com / Stephen Krow; iStockphoto.com / pierrephoto; iStockphoto.com / SuprijonoSuharjoto

A *microphone* is an input device that enables you to speak into a computer or mobile device. Many computers and most mobile devices contain built-in microphones. You also can talk into a *headset*, which contains both a microphone and a speaker. Many headsets can communicate wirelessly with the computer or mobile device. A *webcam* is a digital video (DV) camera that allows you to capture video and usually audio input for your computer or mobile device.

Scanners A *scanner* is a light-sensing input device that converts printed text and images into a form the computer can process (Figure 1-16). A popular type of scanner works in a manner similar to a copy machine, except that instead of creating a paper copy of the document or photo, it stores the scanned document or photo electronically.

Figure 1-16 A scanner.
iStockphoto.com / EdgarasMarozas

Output

Users have a variety of output options to convey text, graphics, audio, and video — many of which involve using an output device. An **output device** is any hardware component that conveys information from a computer or mobile device to one or more people. The following sections discuss common output methods.

Printers A **printer** is an output device that produces text and graphics on a physical medium, such as paper or other material (Figure 1-17). Printed content sometimes is referred to as a *hard copy* or *printout*. Most printers today print text and graphics in both black-and-white and color on a variety of paper types with many capable of printing lab-quality photos. A variety of printers support wireless printing, where a computer or other device communicates wirelessly with the printer.

A *3-D printer* can print solid objects, such as clothing, prosthetics, eyewear, implants, toys, parts, prototypes, and more. 3-D (three-dimensional) printers may use a variety of substances, including plastic, nylon, wood, bronze, and copper, to print the layers that create a 3-D model.

Figure 1-17 A printer can produce a variety of printed output including photos and 3-D solid objects.
Courtesy of Epson America, Inc.; Tinxi / Shutterstock.com

Displays A display is an output device that visually conveys text, graphics, and video information. Displays consist of a screen and the components that produce the information on the screen. The display for a desktop usually is a monitor, which is a separate, physical device. Mobile computers and devices typically integrate the display in their same physical case (Figure 1-18). Many displays have touch screens.

Figure 1-18 Displays vary depending on the computer or mobile device.
iStockphoto.com / Sebastien Cote; David Lentz / Photos.com; Dmitry Rukhlenko / Photos.com; Steve Allen / Dreamstime.com; Pakhnyushcha / Shutterstock.com

Home users sometimes use a digital television or a Smart TV as a display. A *Smart TV* is an Internet-capable high-definition television (HDTV) on which you can use the Internet to watch video, listen to the radio, play games, and communicate with others — all while watching a television show.

CONSIDER THIS

What can you do to ease eyestrain while using a computer or mobile device?
Position the display about 20 degrees below eye level. Clean the screen regularly. Blink your eyes every five seconds. Adjust the room lighting. Face into an open space beyond the screen. Use larger fonts or zoom the display. Take an eye break every 30 minutes. If you wear glasses, ask your doctor about computer glasses.

Figure 1-19 In a crowded environment where speakers are not practical, users can wear headphones to hear music, voice, and other audio.
iStockphoto.com / Photo_Alto

Speakers, Earbuds, and Headphones Speakers allow you to hear audio, that is, music, voice, and other sounds. Most personal computers and mobile devices have a small internal speaker. Many users attach higher-quality speakers to their computers and mobile devices, including game consoles.

So that only you can hear sound, you can listen through earbuds (shown earlier in this module in Figure 1-8) or headphones, which cover or are placed outside of the ear (Figure 1-19). Both earbuds and headphones usually include noise-cancelling technology to reduce the interference of sounds from the surrounding environment. To eliminate the clutter of cords, users can opt for wireless speakers or wireless headphones.

CONSIDER THIS

How can you protect your hearing when using earbuds or headphones?
The lower the volume levels, the less potential hearing damage. Decrease the volume until people near you cannot hear the sound from your earbuds or headphones. Consider using a high-quality set of headphones with noise-cancelling technology. These headphones have improved sound quality so that you do not need to turn up the volume as loud. They also have a better design with a closer fit, which reduces the volume required for optimal listening. Noise-cancelling technology eliminates the external noise, allowing you to reduce the volume level needed. Lastly, if you intend to listen to music through earbuds or headphones for hours at a time, consider listening at only 30 percent maximum volume, because listening for extended periods of time at a high volume may be unsafe for your ears.

Memory and Storage

Memory consists of electronic components that store instructions waiting to be executed and the 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.

Storage, by contrast, holds data, instructions, and information for future use. For example, computers can store hundreds or millions of student names and addresses permanently. A computer keeps data, instructions, and information on **storage media**. Examples of local storage media includes hard disks, solid-state drives, USB (universal serial bus) flash drives, memory cards, and optical discs. The amount of storage for each type of storage media varies, but hard disks and solid-state drives generally have the largest capacities, followed by optical discs, USB flash drives, and memory cards. Some storage media are portable, meaning you can remove the medium from one computer and carry it to another computer.

A **storage device** records (writes) and/or retrieves (reads) items to and from storage media. Storage devices often also function as a source of input and output because they transfer items from storage to memory and vice versa. Drives and readers/writers, which are types of storage devices, accept a specific kind of storage media. For example, a DVD drive (storage device) accepts a DVD (storage media).

BTW
Disk vs. Disc
Disk is the term used to describe hard disks and other magnetic media, and disc is the term used to describe CDs, DVDs, and other optical media.

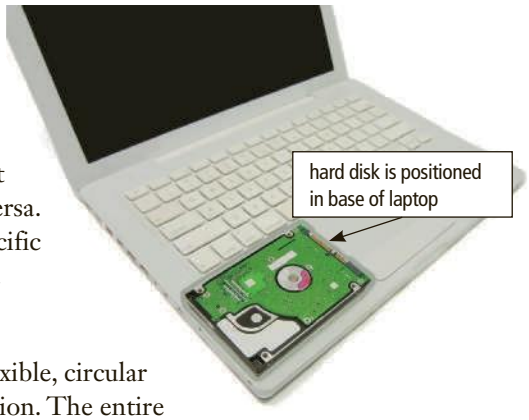


Figure 1-20 A hard disk mounted inside a laptop's case.
iStockphoto.com / Brian Balster

Hard Disks A *hard disk* is a storage device that contains one or more inflexible, circular platters that use magnetic particles to store data, instructions, and information. The entire device is enclosed in an airtight, sealed case to protect it from contamination. Laptops and desktops often contain at least one hard disk that is mounted inside the computer's case (Figure 1-20).

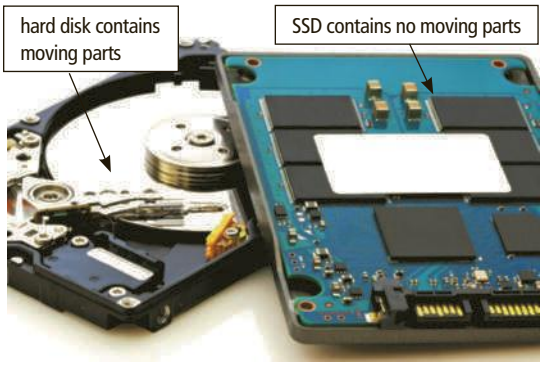


Figure 1-21 A solid-state drive (SSD) is about the same size as a laptop hard disk.
iStockphoto.com / ludinko

Solid-State Drives A *solid-state drive* (SSD) is a storage device that typically uses flash memory to store data, instructions, and information. Flash memory contains no moving parts, making it more durable and shock resistant than other types of media. For this reason, manufacturers typically offer SSDs as an option instead of hard disks in their laptops, tablets, and desktops (Figure 1-21).

CONSIDER THIS

What is an external hard drive?
An external hard drive is a separate, portable, freestanding hard disk or SSD that usually connects to the computer with a cable (Figure 1-22). As with an internal hard disk or SSD, the entire external hard drive is enclosed in an airtight, sealed case.

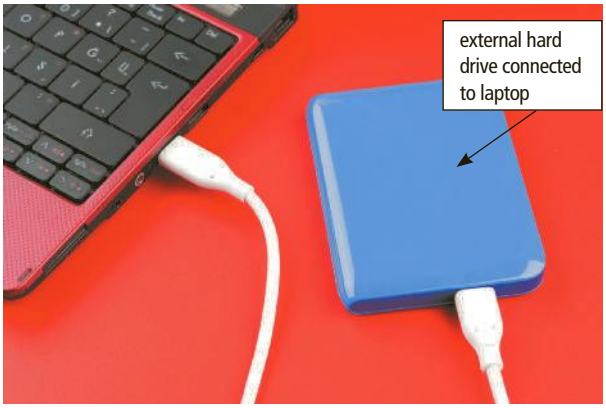


Figure 1-22 A external hard drive is a separate, freestanding storage device.
iStockphoto.com / muratsarica

BTW
Hard Drives
The term **hard drive** is used to collectively refer to hard disks and SSDs.

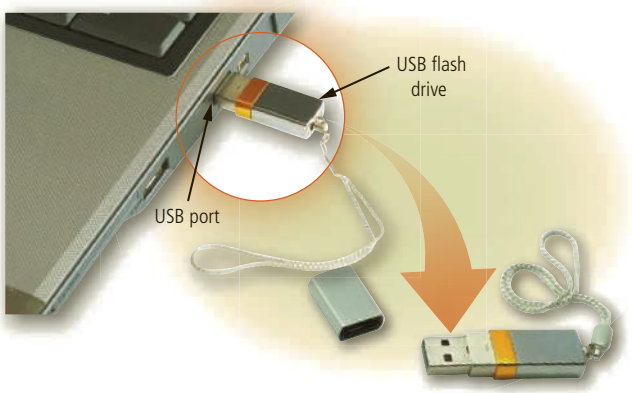


Figure 1-23 You insert a USB flash drive in a USB port on a computer.
Pakhnyushcha / Shutterstock.com

USB Flash Drives A *USB flash drive* is a portable flash memory storage device that you plug in a USB port, which is a special, easily accessible opening on a computer or mobile device (Figure 1-23). USB flash drives are convenient for mobile users because they are small and lightweight enough to be transported on a keychain or in a pocket.

Memory Cards A *memory card* is removable flash memory, usually no bigger than 1.5 inches in height or width, that you insert in and remove from a slot in a computer, mobile device, or card reader/writer (Figure 1-24). With a card reader/writer, you can transfer the stored items, such as digital photos, from a memory card to a computer or printer that does not have a built-in card slot.

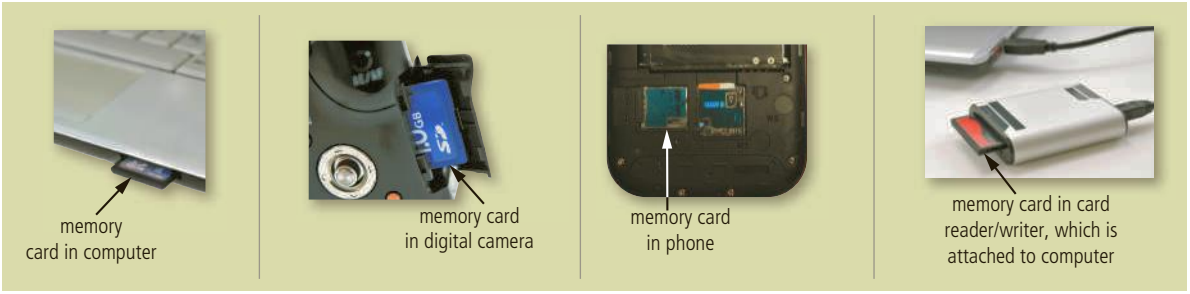


Figure 1-24 Computers and mobile devices use a variety of styles of memory cards to store documents, photos, and other items.
Verisakeet / Fotolia LLC; Sonar / Fotolia LLC; Courtesy of Mark Frydenberg: uwimages / Fotolia LLC

CONSIDER THIS

What is the general use for each type of local storage media?
Hard disks and SSDs store software and all types of user files. A *file* is a named collection of stored data, instructions, or information and can contain text, images, audio, and video. Memory cards and USB flash drives store files you intend to transport from one location to another, such as a homework assignment or photos. Optical discs generally store software, photos, movies, and music.

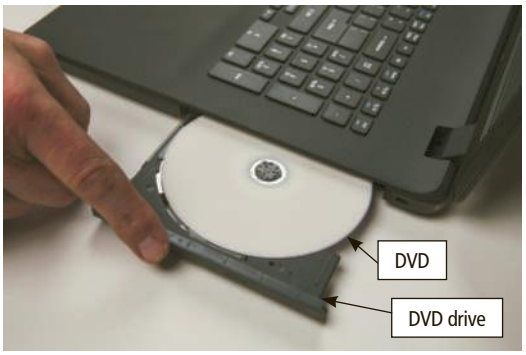


Figure 1-25 You can insert a DVD in a DVD drive on a computer. Some computers have DVD slots instead of DVD drives.
iStockphoto.com / MagMos

Optical Discs An *optical disc* is a type of storage media that consists of a flat, round, portable metal disc made of metal, plastic, and lacquer that is written and read by a laser. CDs (compact discs) and DVDs (digital versatile discs) (Figure 1-25) are two types of optical discs.

Cloud Storage Instead of storing data, instructions, and information locally on a hard drive or other media, some users opt for cloud storage. **Cloud storage** is an Internet service that provides remote storage to computer users. For example, Figure 1-26 shows JustCloud, which provides cloud storage solutions to home and business users.

Types of services offered by cloud storage providers vary. Some provide storage for specific types of media, such as photos, whereas others store any content and provide backup services. A **backup** is a duplicate of content on a storage medium that you can use in case the original is lost, damaged, or destroyed. Read Secure IT 1-1 for suggestions for backing up your computers and mobile devices.

Figure 1-26 JustCloud is an example of a website that provides cloud storage solutions to home and business users.
Source: JustCloud.com

SECURE IT 1-1

Backing Up Computers and Mobile Devices

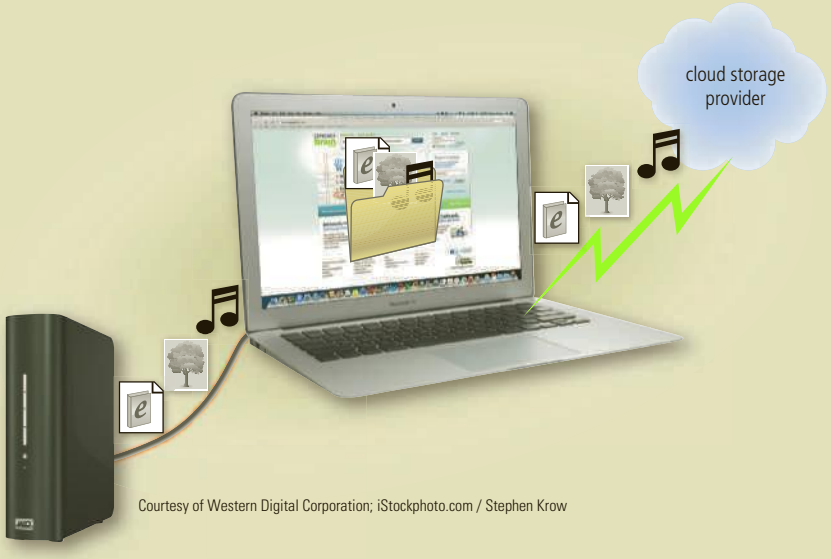
Power outages, hardware failure, theft, and many other factors can cause loss of data, instructions, or information on a computer or mobile device. To protect against loss, you should back up the contents of storage media regularly. Backing up can provide peace of mind and save hours of work attempting to recover important material in the event of a mishap.

A backup plan for laptop and desktop computers could include the following:

- Use a backup program, either included with your computer's operating system or one that you purchased separately, to copy the contents of your entire hard drive to a separate device.
- Regularly copy music, photos, videos, documents, and other important items to an external hard drive, a USB flash drive, or a DVD.
- Subscribe to a cloud storage provider.
- Schedule your files to be backed up regularly.

Backup plans for mobile devices are less specific. Apps for backing up your smartphone or tablet's content are available. You also can back up a mobile device to your computer's hard drive using synchronization software that runs on your computer (synchronization software is discussed later in this module). Some mobile device manufacturers, such as Apple, provide cloud storage solutions to owners of their devices. Other services allow subscribers to use another computer as a backup storage location. Overall, the best advice is to back up often using a variety of methods.

Consider This: Do you back up files regularly? If not, why not? What would you do if you had no backup and then discovered that your computer or mobile device had failed?



Courtesy of Western Digital Corporation; iStockphoto.com / Stephen Krow

The Web

The World Wide Web (or web, for short) is a global library of information available to anyone connected to the Internet. The **Internet** is a worldwide collection of computer networks that connects millions of businesses, government agencies, educational institutions, and individuals (Figure 1-27).

Figure 1-27 The Internet is the largest computer network, connecting millions of computers and devices around the world.

Mmaxer / Shutterstock.com; Alfonso de Tomas / Shutterstock.com; SSSCCC / Shutterstock.com; iStockphoto.com / PetarChernaev; amfoto / Shutterstock.com; iStockphoto.com / Oleksiy Mark; iStockphoto.com / Oleksiy Mark; iStockphoto.com / sweetym; Oleksiy Mark / Shutterstock.com; iStockphoto.com / Stephen Krow; iStockphoto.com / Skip O'Donnell; Source: Apple Inc; iStockphoto.com / Skip O'Donnell; Source: Nutrition Blog Network; iStockphoto.com / AyaazRattansi; Oleksiy Mark / Shutterstock.com

CONSIDER THIS

How do I access the Internet?

Businesses, called Internet service providers (ISPs), offer users and organizations access to the Internet free or for a fee. By subscribing to an ISP, you can connect to the Internet through your computers and mobile devices.

Many everyday devices and objects or "things" are equipped with sensors that transmit data to and from the Internet. The term, the Internet of Things (IoT), is used to collectively refer to this communications capability. The IoT includes activity trackers, smartwatches, thermostats, alarm clocks, coffeemakers, appliances, and more.

CONSIDER THIS

Are the web and Internet the same?

No. The Internet provides more than 3.5 billion home and business users around the world access to a variety of services. The web is one of the widely used services of the Internet. Other popular services include email, instant messaging, VoIP, and FTP (all discussed later in this module).

People around the world access the web to accomplish the following types of online tasks:

- Search for information
- Conduct research
- Communicate with and meet other people
- Share information, photos, and videos with others
- Access news, weather, and sports
- Participate in online training
- Shop for goods and services
- Play games with others
- Download or listen to music
- Watch videos
- Download or read books
- Make reservations

BTW

Downloading

Downloading is the process of transferring existing content stored on a server or other computer or device to your device via a network.

The **web** consists of a worldwide collection of electronic documents. Each electronic document on the web is called a **webpage**, which can contain text, graphics, audio, and video (Figure 1-28). A **website** is a collection of related webpages, which are stored on a web server. A **web server** is a computer that delivers requested webpages to your computer or mobile device.

Webpages often contain links. A *link*, short for *hyperlink*, is a built-in connection to other documents, graphics, audio files, videos, webpages, or websites. To activate an item associated with a link, you click the link. In Figure 1-28, for example, clicking the audio link connects to a live radio show so that you can hear the broadcast. A text link often changes color after you click it to remind you visually that you previously have visited the webpage or downloaded the content associated with the link.

Figure 1-28 Webpages, such as the one shown here, can display text, graphics, audio, and video on a computer or mobile device. Pointing to a link on the screen typically changes the shape of the pointer to a small hand with a pointing index finger.
Source: WTMJ

Links allow you to obtain information in a nonlinear way. That is, instead of accessing topics in a specified order, you move directly to a topic of interest. Some people use the phrase *surfing the web* to refer to the activity of using links to explore the web.

Browsing the Web

A **browser** is software that enables users with an Internet connection to access and view webpages on a computer or mobile device. Some widely used browsers include Chrome, Edge, Firefox, and Safari. Read How To 1-2 for instructions about using a browser to display a webpage on a computer or mobile device.

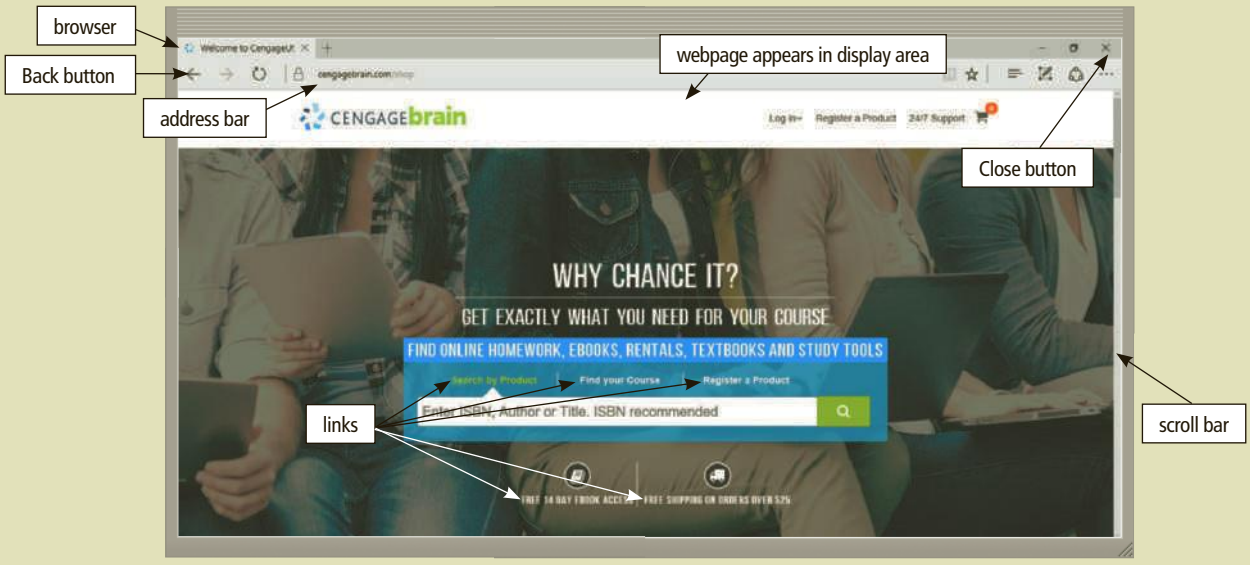
HOW TO 1-2

Use a Browser to Display a Webpage

The following steps describe how to use a browser to display a webpage on a computer or mobile device:

1. Run a browser. (Running programs and apps is discussed later in this module.)
2. If necessary, click the address bar to select it and any previously displayed web address it may contain. (A *web address* is a unique address that identifies a webpage.)
3. In the address bar, type the web address of the webpage you want to visit and then press the ENTER key or click the Go (or similar) button to display the webpage. For example, www.cengagebrain.com is a valid web address, which displays the CengageBrain webpage shown in the figure below. (Module 2 discusses the components of a web address.)
4. If necessary, scroll to view the entire webpage. You can scroll either by sliding your finger across a touch screen or by using a pointing device, such as a mouse, to drag the scroll bar.
5. Click links on the webpage to navigate to the link's destination.

Consider This: What should you do if the web address you enter does not display a webpage or you receive an error message?



Searching the Web

A primary reason that people use the web is to search for specific information, including text, photos, music, and videos. The first step in successful searching is to identify the main idea or concept in the topic about which you are seeking information. Determine any synonyms, alternate spellings, or variant word forms for the topic. Then, use a search engine, such as Google, to help you locate the information. A **search engine** is software that finds websites, webpages, images, videos, news, maps, and other information related to a specific topic. Read How To 1-3 for instructions about how to perform a basic web search using a search engine on a computer or mobile device.

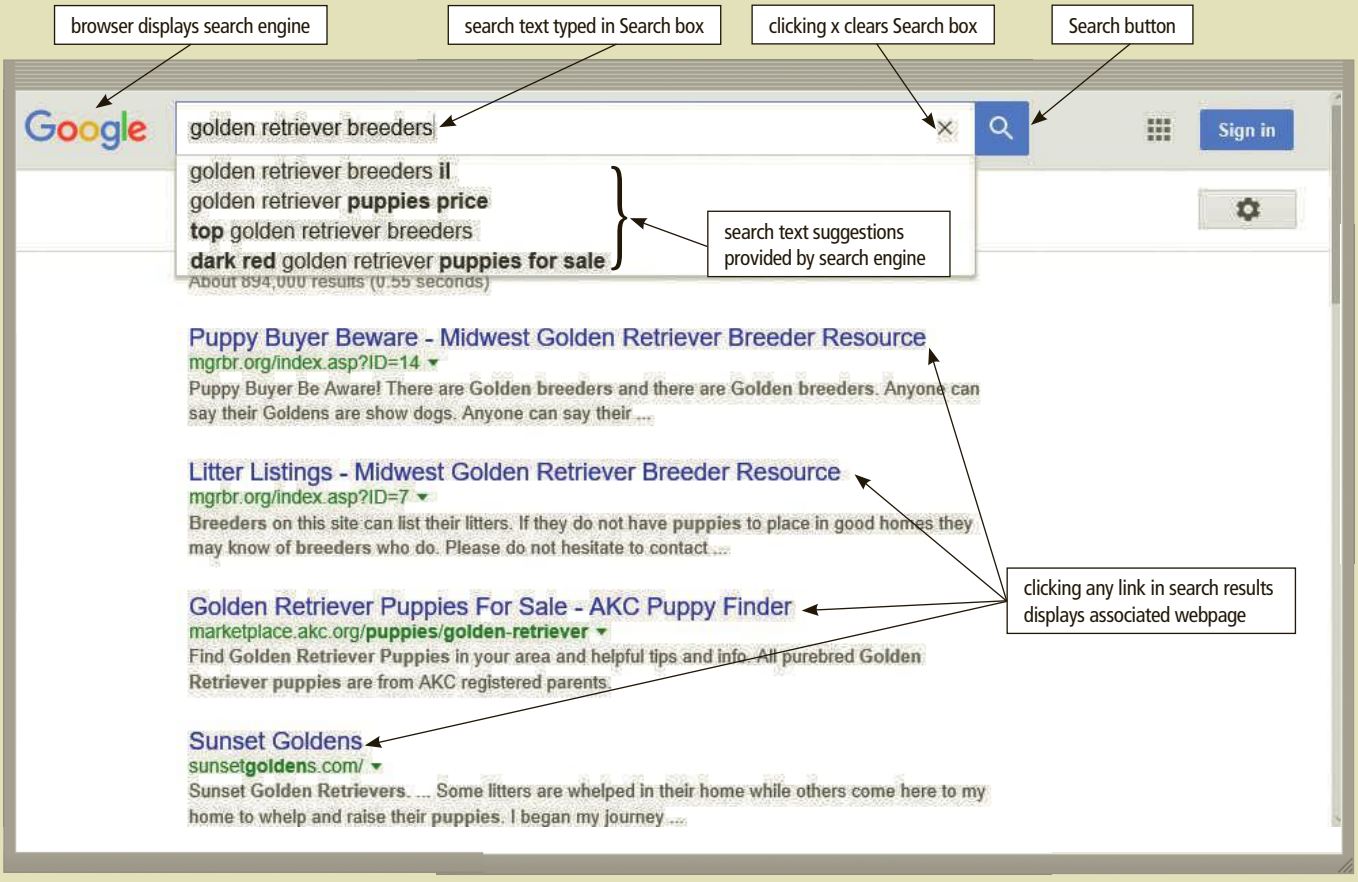
HOW TO 1-3

Perform a Basic Web Search

The following steps describe how to use a search engine on a computer or mobile device to perform a basic web search:

1. Run a browser. (Running programs and apps is discussed later in this module.)
2. Display the search engine's webpage on the screen by entering its web address in the address bar. For example, you could type `google.com` to access the Google search engine, or `bing.com` to access the Bing search engine, or `yahoo.com` to access the Yahoo! search engine.
3. Click the Search box and then type the desired search text in the Search box. The more descriptive the search text, the easier it will be to locate the desired search results. As the figure shows, the search engine may provide search text suggestions as you type search text in the Search box.
4. To display search results based on your typed search text, press the ENTER key or click the Search button. To display search results based on one of the suggestions provided by the search engine, click the desired search text suggestion.
5. Scroll through the search results and then click a search result to display the corresponding webpage.
6. To return to the search results, click the Back button in the browser or on the mobile device, which typically looks like a left-pointing arrow.

Consider This: What search text would you enter to locate the admission criteria for your school?



Source: Google Inc.

Online Social Networks

An **online social network**, also called a *social networking site*, is a website that encourages members in its online community to share their interests, ideas, stories, photos, music, and videos with other registered users (Figure 1-29). Popular online social networks include Facebook, Twitter, and LinkedIn.

Some online social networks have no specialized audience; others are more focused. A photo sharing site, for example, is a specific type of online social network that allows users to create an online photo album and store and share their digital photos. Similarly, a video sharing site is a type of online social network that enables users to store and share their personal videos. Read Ethics & Issues 1-2 to consider whether you should be required to obtain permission before posting photos of others.

Figure 1-29 When Facebook users share, comment on, or "like" a post, the post appears on their own personal Facebook pages.
iStockphoto.com / RossHelen

CONSIDER THIS

How do Facebook, Twitter, and LinkedIn differ?

With Facebook, you share messages, interests, activities, events, photos, and other personal information — called posts — with family and friends. You also can 'like' pages of celebrities, companies, products, etc., so that posts from others who like the same items will appear along with your other activities on Facebook. With Twitter, you 'follow' people, companies, and organizations in which you have an interest. Twitter enables you to stay current with the daily activities of those you are following via their Tweets, which are short posts (messages) that Twitter users broadcast for all their followers.

On LinkedIn, you share professional interests, education, and employment history, and add colleagues or coworkers to your list of contacts. You can include recommendations from people who know you professionally. Many employers post jobs using LinkedIn and consider information in your profile as your online resume.

BTW

Blogs

Posts on Twitter also form a blog, because of its journal format with the most recent entry at the top.

ETHICS & ISSUES 1-2

Should You Be Required to Obtain Permission before Posting Photos of Others?

Your friends and followers on online social networks instantly can view photos you post. If others appear in the photo and you post it without their permission, they might feel you have violated their privacy. Tagging people in a photo may create a link to their social network profiles, exposing their identity. Depending on your privacy settings, your friends' contacts can view a photo you post and/or share the photo without your permission.

You may be able to adjust tagging rules in the privacy settings of your online social network account. For example, you can use Facebook's privacy settings to approve all photos in which others tag you. The person posting the photo still can upload the photo, but the photo's tag will not be linked to your social media account until you approve the tag. Facebook also allows you to report a photo as abusive if you feel it portrays you negatively or if the person who posted it refuses to remove it upon request. Facebook's own Statement of Rights and Responsibilities states that "You will not tag users ... without their consent."

People may not want photos of themselves posted for a variety reasons. They may have professional contacts as friends on their online social network and do not want to show themselves in a personal setting. Others may not be concerned with personal photos of themselves but do not want their children's photos shared online. Or, they simply may find the photo unflattering. A poll by Sophos stated that more than 90 percent of respondents felt they should be asked before someone posts a photo of them online. Eight percent of respondents felt that it should be illegal to do so.

Consider This: Is it ever acceptable to post photos of others without permission? Why or why not? Has someone posted or tagged you in a photo that you did not want others to see? How did you handle the situation? If asked to remove a photo or tag, would you respect the person's feelings and honor the request? What restrictions and policies should online social networks have about posting photos of others?

Internet Communications

As mentioned earlier, the web is only one of the services on the Internet. Other services on the Internet facilitate communications among users, including the following:

- Email allows you to send messages to and receive messages and files from other users via a computer network.
- With messaging services, you can have a real-time typed conversation with another connected user (real-time means that both of you are online at the same time).
- VoIP (Voice over Internet Protocol) enables users to speak to other users over the Internet (discussed further in later modules).
- With FTP (File Transfer Protocol), users can transfer items to and from other computers on the Internet (discussed further in later modules).

Digital Security and Privacy

People rely on computers to create, store, and manage their information. To safeguard this information, it is important that users protect their computers and mobile devices. Users also should be aware of health risks and environmental issues associated with using computers and mobile devices.

BTW

Malware

A recent study by Statista reports that security software blocks more than one million malware attacks every day.

Viruses and Other Malware

Malware, short for malicious software, is software that typically acts without a user's knowledge and deliberately alters the computer's or mobile device's operations. Examples of malware include viruses, worms, trojan horses, rootkits, spyware, adware, and zombies. Each of these types of malware attacks your computer or mobile device differently. Some are harmless pranks that temporarily freeze, play sounds, or display messages on your computer or mobile device. Others destroy or corrupt data, instructions, and information stored on the infected computer or mobile device. If you notice any unusual changes in the performance of your computer or mobile device, it may be infected with malware. Read Secure IT 1-2 for ways to protect computers from viruses and other malware.

SECURE IT 1-2

Protection from Viruses and Other Malware

It is impossible to ensure a virus or malware never will attack a computer, but you can take steps to protect your computer by following these practices:

- **Use virus protection software.** Install a reputable antivirus program and then scan the entire computer to be certain it is free of viruses and other malware. Update the antivirus program and the virus signatures (known specific patterns of viruses) regularly.
- **Use a firewall.** Set up a hardware firewall or install a software firewall that protects your network's resources from outside intrusions.
- **Be suspicious of all unsolicited email and text messages.** Never open an email message unless you are expecting it, *and* it is from a trusted source. When in doubt, ask the sender to confirm the message is legitimate before you open it. Be especially cautious when deciding whether to click links in email and text messages or to open attachments.
- **Disconnect your computer from the Internet.** If you do not need Internet access, disconnect the computer from the Internet. Some security experts recommend disconnecting from the network before opening email attachments.
- **Download software with caution.** Download programs or apps only from websites you trust, especially those with music and video sharing software.
- **Close spyware windows.** If you suspect a pop-up window (a rectangular area that suddenly appears on your screen) may be spyware, close the window. Never click an Agree or OK button in a suspicious window.
- **Before using any removable media, scan it for malware.** Follow this procedure even for shrink-wrapped software from major developers. Some commercial software has been infected and distributed to unsuspecting users. Never start a computer with removable media inserted in the computer unless you are certain the media are uninfected.
- **Keep current.** Install the latest updates for your computer software. Stay informed about new virus alerts and virus hoaxes.
- **Back up regularly.** In the event your computer becomes unusable due to a virus attack or other malware, you will be able to restore operations if you have a clean (uninfected) backup.

Consider This: What precautions do you take to prevent viruses and other malware from infecting your computer? What new steps will you take to attempt to protect your computer?

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. Some techniques you can use to protect yourself from identity theft include shredding financial documents before discarding them, never clicking links in unsolicited email messages, and enrolling in a credit monitoring service.

Adults, teens, and children around the world are using online social networks to share their photos, videos, journals, music, and other personal information publicly. 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 in email messages and on websites. For example, do not share information that would allow others to identify or locate you, and do not disclose identification numbers, user names, passwords, or other personal security details. A user name is a unique combination of characters, such as letters of the alphabet or numbers, that identifies one specific user. A password is a private combination of characters associated with a user name. Read Secure IT 1-3 for tips on creating strong passwords.

SECURE IT 1-3

Creating Strong Passwords

A good password is easy for you to remember but difficult for criminals and password-breaking software to guess. Use these guidelines to create effective, strong passwords:

- **Personal information:** Avoid using any part of your first or last name, your family members' or pets' names, phone number, street address, license plate number, Social Security number, or birth date.
- **Length and Difficulty:** Use at least eight characters, including a variety of uppercase and lowercase letters, numbers, punctuation marks, and symbols. Select characters located on different parts of the keyboard, not the ones you commonly use or that are adjacent to each other. Criminals often use software that converts common words to symbols, so their program might generate the passwords GoToSleep and Go2Sleep as possibilities to guess.
- **Modify:** Change your password frequently, at least every three months.
- **Variation:** Do not use the same password for all websites you access. Once criminals have stolen a password, they attempt to use that password for other accounts they find on your computer or mobile device, especially banking websites.
- **Passphrase:** A passphrase, which is similar to a password, consists of several words separated by spaces. Security experts recommend misspelling a few of the words and adding several numerals. For example, the phrase, "Create a strong password," could become the passphrase, "Creaet a strang pasword42."
- **Common sequences:** Avoid numbers or letters in easily recognized patterns, such as "asdfjkl;," "12345678," "09870987," or "abcdefg." Also, do not spell words backward, use common abbreviations, or repeat strings of letters or numbers.
- **Manage:** Do not keep your passwords in your wallet, on a sheet of paper near your computer, or in a text file on your computer or mobile device. Memorize all of your passwords, or store them securely using a password management app on your computer or mobile device. Additional information about password management software is provided in Module 5.
- **Test:** Use online tools to evaluate password strength.

Consider This: How strong are your passwords? How will you modify your passwords using some of these guidelines?

Health Concerns

Prolonged or improper computer and mobile device use can lead to injuries or disorders of the hands, wrists, elbows, eyes, neck, and back. Computer and mobile device users can protect themselves from these health risks through proper workplace design, good posture while at the computer, and appropriately spaced work breaks.

With the growing use of earbuds and headphones, some users are experiencing hearing loss. Ways to protect your hearing when using these devices were presented earlier in this module.

Two behavioral health risks are technology addiction and technology overload. Technology addiction occurs when someone becomes obsessed with using technology. Individuals suffering from technology overload feel distressed when deprived of computers and mobile devices. Once recognized, both technology addiction and technology overload are treatable disorders.

Environmental Issues

Manufacturing processes for computers and mobile devices, along with *e-waste* (discarded computers and mobile devices), are depleting natural resources and polluting the environment. When computers and mobile devices are stored in basements or other locations, disposed of in landfills, or burned in incinerators, they can release toxic materials and potentially dangerous levels of lead, mercury, and flame retardants.

Green computing involves reducing the electricity consumed and environmental waste generated when using a computer. Strategies that support green computing include recycling, using energy-efficient hardware and energy-saving features, regulating manufacturing processes, extending the life of computers, and immediately donating or properly disposing of replaced computers. When you purchase a new computer, some retailers offer to dispose of your old computer properly.

CONSIDER THIS

How can you contribute to green computing?

Some habits you can alter that will help reduce the environmental impact of computing include the following:

1. Do not leave a computer or device running overnight.
2. Turn off your monitor, printer, and other devices when you are not using them.
3. Use energy-efficient hardware.
4. Use paperless methods to communicate.
5. Recycle paper and buy recycled paper.
6. Recycle toner, computers, mobile devices, printers, and other devices.
7. Telecommute.
8. Use videoconferencing and VoIP for meetings.

Programs and Apps

Software, also called a **program**, consists of a series of related instructions, organized for a common purpose, that tells the computer what tasks to perform and how to perform them.

Two categories of software are system software and application software (or applications). System software consists of the programs that control or maintain the operations of the computer and its devices. Operating systems are a widely recognized example of system software. Other types of system software, sometimes called tools, enable you to perform maintenance-type tasks usually related to managing devices, media, and programs used by computers and mobile devices. The next sections discuss operating systems and applications.

Figure 1-30 Shown here are the macOS and Windows operating systems for laptops and desktops and the Android and iOS operating systems for smartphones. You interact with these operating system interfaces by clicking or tapping their icons or tiles.

Courtesy of Apple Inc.; Ivan Garcia / Shutterstock.com; Courtesy of Apple Inc.; Courtesy of Microsoft

Operating Systems

An *operating system* is a set of programs that coordinates all the activities among computer or mobile device hardware. It provides a means for users to communicate with the computer or mobile device and other software. Many of today's computers and mobile devices use a version of Microsoft's Windows, Apple's macOS, Apple's iOS, or Google's Android (Figure 1-30).

To use an application, your computer or mobile device must be running an operating system.

Applications

An **application** (or **app** for short) consists of programs designed to make users more productive and/or assist them with personal tasks. Browsers, discussed in an earlier section, are an example of an application that enables users with an Internet connection to access and view webpages. Table 1-2 identifies the categories of applications with samples of ones commonly used in each category.

Table 1-2 Categories of Applications

Category	Sample Applications	Sample Uses
Productivity 	Word Processing	Create letters, reports, and other documents.
	Presentation	Create visual aids for presentations.
	Schedule and Contact Management	Organize appointments and contact lists.
	Personal Finance	Balance checkbook, pay bills, and track income and expenses.
Graphics and Media 	Photo Editing	Modify digital photos, i.e., crop, remove red-eye, etc.
	Video and Audio Editing	Modify recorded movie clips, add music, etc.
	Media Player	View images, listen to audio/music, watch videos.
Personal Interest 	Travel, Mapping, and Navigation	View maps, obtain route directions, locate points of interest.
	Reference	Look up material in dictionaries, encyclopedias, etc.
	Educational	Learn through tutors and prepare for tests.
	Entertainment	Receive entertainment news alerts, check movie times and reviews, play games.
Communications 	Browser	Access and view webpages.
	Email	Send and receive messages.
	VoIP	Speak to other users over the Internet.
	FTP	Transfer items to and from other computers on the Internet.
Security 	Antivirus	Protect a computer against viruses.
	Personal Firewall	Detect and protect against unauthorized intrusions.
	Spyware, Adware, and Other Malware Removers	Detect and delete spyware, adware, and other malware.
File, System, and Disk Management 	File Manager	Display and organize files on storage media.
	Search	Locate files and other items on storage media.
	Image Viewer	Display, copy, and print contents of graphics files.
	Screen Saver	Shows moving image or blank screen if no keyboard or mouse activity occurs.

Courtesy of NCH Software; Source: Apple Inc.; Source: Google Inc.; Courtesy of AVG Technologies

Applications include programs stored on a computer, as well as those on a mobile device or delivered to your device over the Internet.

- A *desktop app* is an application stored on a computer.
- A *web app* is an application stored on a web server that you access through a browser.
- A *mobile app* is an application you download from a mobile device's app store or other location on the Internet to a smartphone or other mobile device.

Some applications are available as both a web app and a mobile app. In this case, you typically can sync (or match) the data and activity between the web app and the mobile app, which is discussed later in this module.

Installing and Running Programs

Installing a program is the process of setting up the program to work with a computer or mobile device, printer, and/or other hardware. When you buy a computer or mobile device, it usually has some software, such as an operating system, preinstalled on its internal media so that you can use the computer or mobile device the first time you turn it on.

Installed operating systems often include applications such as a browser, media player, and calculator. To use additional desktop apps on a computer, you usually need to install the software. Mobile apps typically install automatically after you transfer the app's files to your mobile device from its website. You usually do not need to install web apps before you can run them.

Once installed, you run a program so that you can interact with it. When you instruct a computer or mobile device to run a program, the computer or mobile device *loads* it, which means the program's instructions are copied from storage to memory. Once in memory, the computer or mobile device can carry out, or execute, the instructions in the program so that you can use it.

You interact with a program through its user interface. The *user interface* controls how you enter data and instructions and how information is displayed on the screen. Often, you work with icons or tiles (shown previously in Figure 1-30), which are miniature images that link to programs, media, documents, or other objects.

CONSIDER THIS

How do you know if a program will run on your computer?

When you buy a computer, you can find a list of the computer's specifications on the box, the manufacturer's website, or the order summary. Similarly, when you buy software, the box or the product's website will list specifications and minimum requirements for memory, speed, and more. Your computer's specifications should be the same as or greater than the software specifications. Ensure the software will run on your computer before making a purchase, because many retailers will not allow you to return software.

Developing Programs and Apps

A *software developer*, sometimes called a developer or programmer, is someone who develops programs and apps or writes the instructions that direct the computer or mobile device to process data into information. When writing instructions, a developer must be sure the program or app works properly so that the computer or mobile device generates the desired results. Complex programs can require thousands to millions of instructions.

Software developers use a programming language or application development tool to create programs and apps. Popular programming languages include C++, Java, JavaScript, Visual C#, and Visual Basic. Figure 1-31 shows some of the Visual Basic instructions a software developer may write to create a simple payroll program.

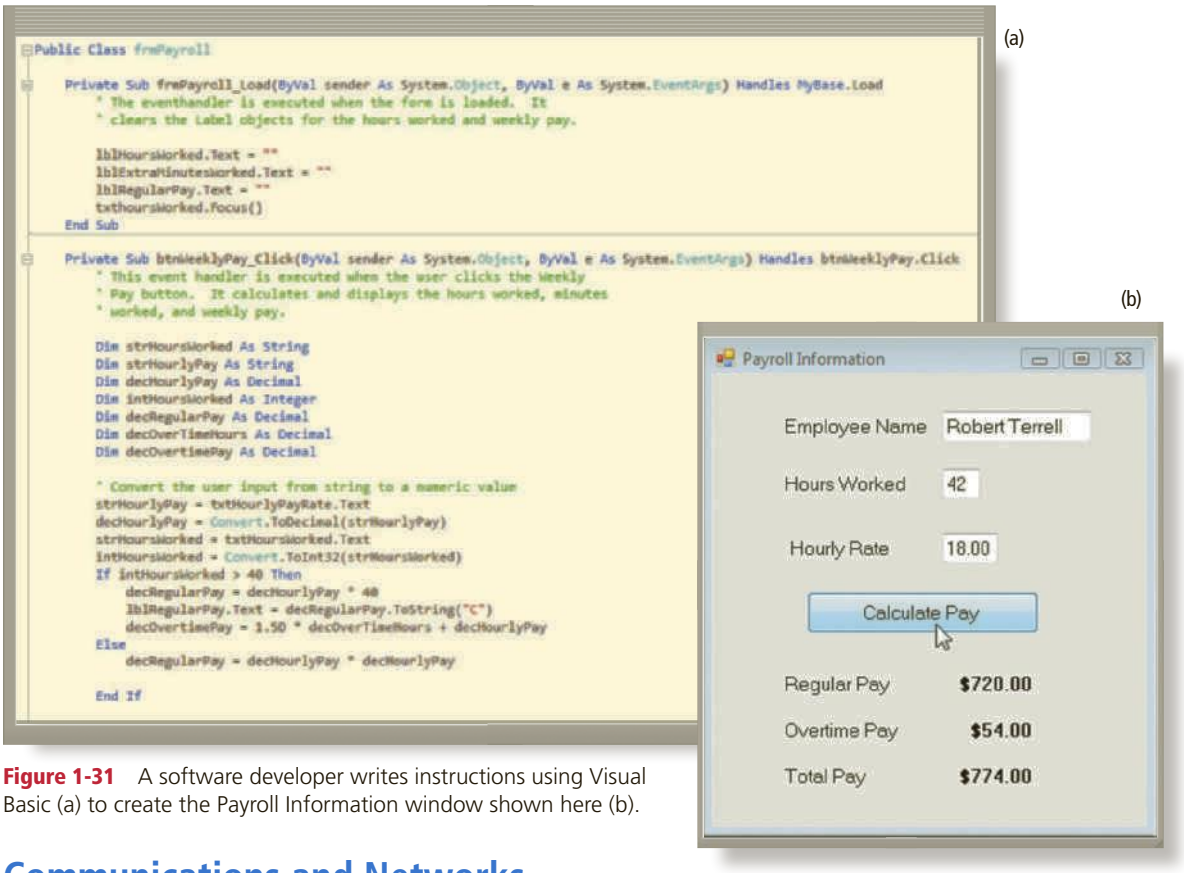


Figure 1-31 A software developer writes instructions using Visual Basic (a) to create the Payroll Information window shown here (b).

Communications and Networks

Communications technologies are everywhere. Many require that you subscribe to an Internet service provider. With others, an organization such as a business or school provides communications services to employees, students, or customers.

In the course of a day, it is likely you use, or use information generated by, one or more of the communications technologies in Table 1-3.

Table 1-3 Uses of Communications Technologies

Type	Brief Description
Chat rooms	Real-time typed conversation among two or more people on a computers or mobile devices connected to a network
Email	Transmission of messages and files via a computer network
Fax	Transmission and receipt of documents over telephone lines
FTP	Permits users to transfer files to and from servers on the Internet
GPS	Navigation system that assists users with determining their location, ascertaining directions, and more
Instant messaging	Real-time typed conversation with another connected user where you also can exchange photos, videos, and other content
Internet	Worldwide collection of networks that links millions of businesses, government agencies, educational institutions, and individuals
Newsgroups	Online areas in which users have written discussions about a particular subject
RSS	Specification that enables web content to be distributed to subscribers
Videoconference	Real-time meeting between two or more geographically separated people who use a network to transmit audio and video
Voice mail	Allows users to leave a voice message for one or more people
VoIP	Conversation that takes place over the Internet using a telephone connected to a computer, mobile device, or other device
Wireless Internet access points	Enables users with computers and mobile devices to connect to the Internet wirelessly
Wireless messaging services	Send and receive wireless messages to and from smartphones, mobile phones, handheld game devices, and other mobile devices using text messaging and picture/video messaging

Wired and Wireless Communications

Computer communications describes a process in which two or more computers or devices transfer (send and receive) data, instructions, and information over transmission media via a communications device(s). A **communications device** is hardware capable of transferring items from computers and devices to transmission media and vice versa. Examples of communications devices are modems, wireless access points, and routers. As shown in Figure 1-32, some communications involve cables and wires; others are sent wirelessly through the air.

Figure 1-32 Modems, wireless access points, and routers are examples of communications devices that enable communications between computers/mobile devices and the Internet. Notice that some computers and devices communicate via wires, and others communicate wirelessly.

iStockphoto.com / Petar Chernaev; iStockphoto.com / Oleksiy Mark; Patryk Kosmider / Shutterstock.com.; Pablo Eder / Shutterstock.com; iStockphoto.com / 123render.; iStockphoto.com / aquarius83men

Wired communications often use some form of telephone wiring, coaxial cable, or fiber-optic cables to send communications signals. The wiring or cables typically are used within buildings or underground between buildings.

Because it is more convenient than installing wires and cables, many users opt for wireless communications, which sends signals through the air or space. Examples of wireless communications technologies include Wi-Fi, Bluetooth, and cellular radio, which are discussed below:

- **Wi-Fi** uses radio signals to provide high-speed Internet and network connections to computers and devices capable of communicating via Wi-Fi. Most computers and many mobile devices, such as smartphones and portable media players, can connect to a Wi-Fi network.
- **Bluetooth** uses short-range radio signals to enable Bluetooth-enabled computers and devices to communicate with each other. For example, Bluetooth headsets allow you to connect a Bluetooth-enabled phone to a headset wirelessly.
- Cellular radio uses the cellular network to enable high-speed Internet connections to devices with built-in compatible technology, such as smartphones. Cellular network providers use the categories 3G, 4G, and 5G to denote cellular transmission speeds, with 5G being the fastest.

Wi-Fi and Bluetooth are both hot spot technologies. A *hot spot* is a wireless network that provides Internet connections to mobile computers and devices. Wi-Fi hot spots provide wireless network connections to users in public locations, such as airports and airplanes, train stations, hotels, convention centers, schools, campgrounds, marinas, shopping malls, bookstores, libraries, restaurants, coffee shops, and more. Bluetooth hot spots provide location-based services, such as sending coupons or menus, to users whose Bluetooth-enabled devices enter the coverage range.

Networks

A **network** is a collection of computers and devices connected together, often wirelessly, via communications devices and transmission media. 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, called clients, request resources from the server (Figure 1-33). The major differences between the server and client computers are that the server typically 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. Users often are required to sign in to, or log on, a network, which means they enter a user name and password (or other credentials) to access the network and its resources.

BTW

The Internet

The world's largest computer network is the Internet.

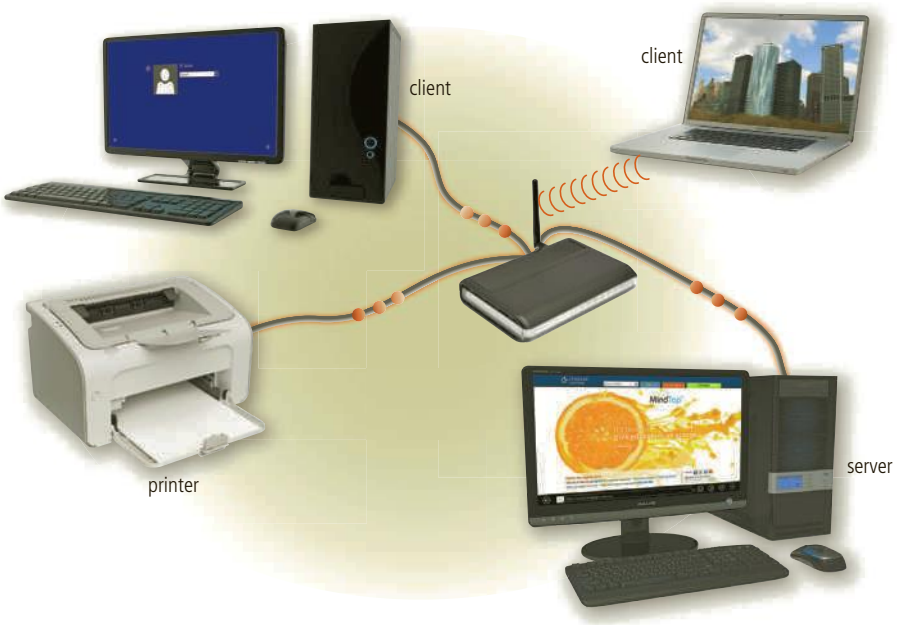


Figure 1-33 A server manages the resources on a network, and clients access the resources on the server. This network enables three separate computers to share the same printer, one wirelessly.

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Home Networks Home networks save the home user money and provide many conveniences. Each networked computer or mobile device on a home network has the following capabilities:

- Connect to the Internet at the same time
- Share a single high-speed Internet connection
- Access photos, music, videos, and other content on computers and devices throughout the house
- Share devices such as a printer, scanner, or external hard drive
- Play multiplayer games with players on other computers and mobile devices in the house
- Connect game consoles to the Internet
- Subscribe to and use VoIP
- Interact with other devices in a smart home (such as thermostats, lighting controls, etc.)

Home networks usually are small, existing within a single structure, and use wireless technologies such as those shown previously in Figure 1-32. You do not need extensive knowledge of networks to set up a home network. You will need a communications device, such as a router, which usually includes setup instructions. Most operating systems also provide tools enabling you easily to connect all the computers and devices in your house.

Business Networks Business and school networks can be small, such as in a room or building, or widespread, connecting computers and devices across a city, country, or the globe. Some reasons that businesses network their computers and devices together include the following:

- **Facilitate communications.** Using a network, employees and customers communicate efficiently and easily via email, messaging services, blogs, online social networks, video calls, online meetings, videoconferencing, VoIP, and more.
- **Share hardware.** In a networked environment, each computer on the network can access the hardware on the network, instead of providing each user with the same piece of hardware. For example, computer and mobile device users can access the laser printer on the network, as they need it.
- **Share data, information, and software.** In a networked environment, any authorized computer user can access data, information, and software stored on other computers on the network. A large company, for example, might have a database of customer information that any authorized user can access.

Tech Feature 1-2: Staying in Sync

If you use multiple computers and mobile devices throughout the day, keeping track of common files may be difficult. Read Tech Feature 1-2 to learn how to keep your computers and devices in sync with one another.

TECH FEATURE 1-2

Staying in Sync

Assume that each morning you begin the day by checking your appointment calendar on your home or office computer. That same calendar appears on your smartphone, so that you can view your schedule throughout the day. If you add, change, or delete appointments using the smartphone, however, you may need to update the calendar on your computer to reflect these edits. When you **synchronize**, or **sync**, computers and mobile devices, you match the files in two or more locations with each other, as shown in the figure below. Along with appointments, other commonly synced files from a smartphone are photos, email messages, music, apps, contacts, calendars, and ringtones.

Syncing can be a one-way or a two-way process. With a one-way sync, also called mirroring, you add, change, or delete files in a destination location, called the *target*, without altering the same files in the original location, called the *source*. For example, you may have a large collection of music stored on your home computer (the source), and you often copy some of these songs to your mobile device (the target). If you add or delete songs from your computer, you also will want to add or change these songs on your mobile device. If, however, you add or change the songs on your mobile device, you would not want to make these changes on your computer.

In two-way sync, any change made in one location also is made in any other sync location. For example, you and your friends may be working together to create one document reflecting your combined ideas. This document could be stored on a network or on cloud storage on the Internet. Your collaboration efforts should reflect the latest edits each person has made to the file.

You can use wired or wireless methods to sync. In a wired setup, cables connect one device to another, which allows for reliable data transfer. While wireless syncing offers convenience and automation, possible issues include battery drain and low signal strength when the devices are not close to one another. Strategies for keeping your files in sync include the following:

- **Use a cable and software.** Syncing photos from a camera or a smartphone to a computer frees up memory on the mobile device and creates a backup of these files. You easily can transfer photos using a data sync cable and synchronization software. Be

iStockphoto.com / 123render; iStockphoto.com / Moncherie; iStockphoto.com / Ivan Stevanovic; Courtesy of Western Digital Corporation

certain not to disconnect the mobile device from the computer until the sync is complete. You also can copy your photos and documents from the computer to a smartphone, an external hard drive, a USB flash drive, or some other portable storage device.

- **Use cloud storage.** Cloud storage can provide a convenient method of syncing files stored on multiple computers and accessing them from most devices with Internet access. Several cloud storage providers offer a small amount of storage space at no cost and additional storage for a nominal fee per month or per year. Each provider has specific features, but most allow users to share files with other users, preview file contents, set passwords, and control who has permission to edit the files.
- **Use web apps.** By using web apps for email, contacts, and calendars, your information is stored online, so that it is accessible anywhere you have an Internet connection and can sync with multiple devices.

Consider This: Synchronization is an effective method of organizing and sharing common files. What files have you synced, such as photos, music, and email messages? Which sync method did you use?

Technology Uses

Technology has changed society today as much as the industrial revolution changed society in the eighteenth and nineteenth centuries. People interact directly with technology in fields such as education, government, finance, retail, entertainment, health care, science, travel, publishing, and manufacturing.

CONSIDER THIS

How does technology impact crowdsourcing?

Crowdsourcing is the practice of involving a large group of people — the crowd — to collectively contribute time, services, funds, expertise, or ideas to a project, cause, or other goal. Many crowdsourcing activities today are organized and promoted via online social networks, websites, or apps. For example, you can create a fundraising campaign, share traffic updates, support entrepreneurs starting businesses, or hire a private driver.

Education/Tech Feature 1-3: Digital School

Educators and teaching institutions use technology to assist with education. Most equip labs and classrooms with laptops or desktops. Some even provide computers or mobile devices to students. Many require students to have a mobile computer or mobile device to access the school's network or Internet wirelessly, or to access digital content provided by a textbook publisher. To promote the use of technology in education, vendors often offer substantial student discounts on hardware and software.

Educators may use a course management system, sometimes called a learning management system, which is software that contains tools for class preparation, distribution, and management. For example, through the course management system, students access course materials, grades, assessments, and a variety of collaboration tools.

Many schools offer distance learning classes, where the delivery of education occurs at one place while the learning occurs at other locations. Distance learning courses provide time, distance, and place advantages for students who live far from a campus or work full time.

A few schools offer entire degrees online. National and international companies offer distance learning training because it eliminates the costs of airfare, hotels, and meals for centralized training sessions.

Read Tech Feature 1-3 to learn about additional technologies integrated in the classroom.

TECH FEATURE 1-3

Digital School

Technology and education intersect in today's classrooms. Students can use a variety of devices, apps, and websites to collaborate and obtain content, while teachers can share information in most content areas to engage students and enhance the learning process. Digital technology offers flexibility and a revised classroom setting.

- **Mobile devices and tablets:** Schools are updating their computer labs by eliminating rows of desktops and allowing students to bring their own devices into the room and also into their classrooms, a practice often referred to as *BYOD* (bring your own device).
- **Virtual field trips:** Virtual tours of museums, ancient sites, and galleries allow audiences to see exhibits, examine paintings, and explore historical objects. After viewing 360-degree panoramas of such places as Colonial Williamsburg and Machu Picchu, students can interact with experts via online social networks and videoconferencing.
- **Games and simulations:** Game design theory can help engage students and reinforce key concepts. When students master one set of objectives in a particular topic, they can progress to more advanced levels. They can receive instant feedback and recognition for their accomplishments, collaborate with teammates, repeat play to achieve higher scores, and document their experiences. Researchers claim that students are more likely to pursue challenging subject matter when it is offered in a gaming setting.
- **Interactive whiteboards:** Teachers and students can write directly on an interactive display, shown in the figure, which is a touch-sensitive device resembling a dry-erase board. It displays images on a connected computer screen. Touch gestures are used to zoom, erase, and annotate displayed content.

Used with permission of SMART Technologies ULC (www.smarttech.com). SMART Board and the SMART logo are trademarks of SMART Technologies ULC and may be registered in the European Union, Canada, the United States and other countries.

- **Share projects:** Effective movies can bring the words in a textbook to life. Students can create scripts and then use animation software or a video camera to tell stories that apply the concepts they have learned and upload them to media sharing websites. They also can write blogs, design graphics, and conduct interviews to apply and share the concepts they have learned in the classroom.
- **3-D printers:** Low-cost 3-D printers created for the classroom and libraries are becoming popular, especially in science and engineering classes. Geology students can create topography models, biology students can examine cross sections of organs, architecture students can print prototypes of their designs, and history students can create artifacts.

Consider This: Which digital technologies have you used in your classrooms? Did they help you learn and retain information presented? If so, how?

Government

Most government offices have websites to provide citizens with up-to-date information. People in the United States access government websites to view census data, file taxes, apply for permits and licenses, pay parking tickets, buy stamps, report crimes, apply for financial aid, and renew vehicle registrations and driver's licenses.

Employees of government agencies use computers as part of their daily routine. North American 911 call centers use computers to dispatch calls for fire, police, and medical assistance. Military and

other agency officials use the U.S. Department of Homeland Security's network of information about domestic security threats to help protect against terrorist attacks. Law enforcement officers have online access to the FBI's National Crime Information Center (NCIC) through in-vehicle laptops, fingerprint readers, and mobile devices (Figure 1-34). The NCIC contains more than 12 million missing persons and criminal records, including names, fingerprints, parole/probation records, mug shots, and other information.

Figure 1-34 Law enforcement officials use computers and mobile devices to access emergency, missing person, and criminal records in computer networks in local, state, and federal agencies.

iStockphoto.com / jacomstephens

Finance

Many people and companies use online banking or finance software to pay bills, track personal income and expenses, manage investments, and evaluate financial plans. The difference between using a financial institutions' website versus finance software on your computer is that all your account information is stored on the bank's computer instead of your computer. The advantage is you can access your financial records from anywhere in the world.

Investors often use online investing to buy and sell stocks and bonds — without using a broker. With online investing, the transaction fee for each trade usually is much less than when trading through a broker.

Retail

You can purchase just about any product or service on the web, including groceries, flowers, books, computers and mobile devices, music, movies, airline tickets, and concert tickets. To purchase from an online retailer, a customer visits the business's storefront, which contains product descriptions, images, and a shopping cart. The shopping cart allows the customer to collect purchases. When ready to complete the sale, the customer enters personal data and the method of payment, which should be through a secure Internet connection. Figure 1-35 illustrates the steps involved when a customer purchases from an online retailer.

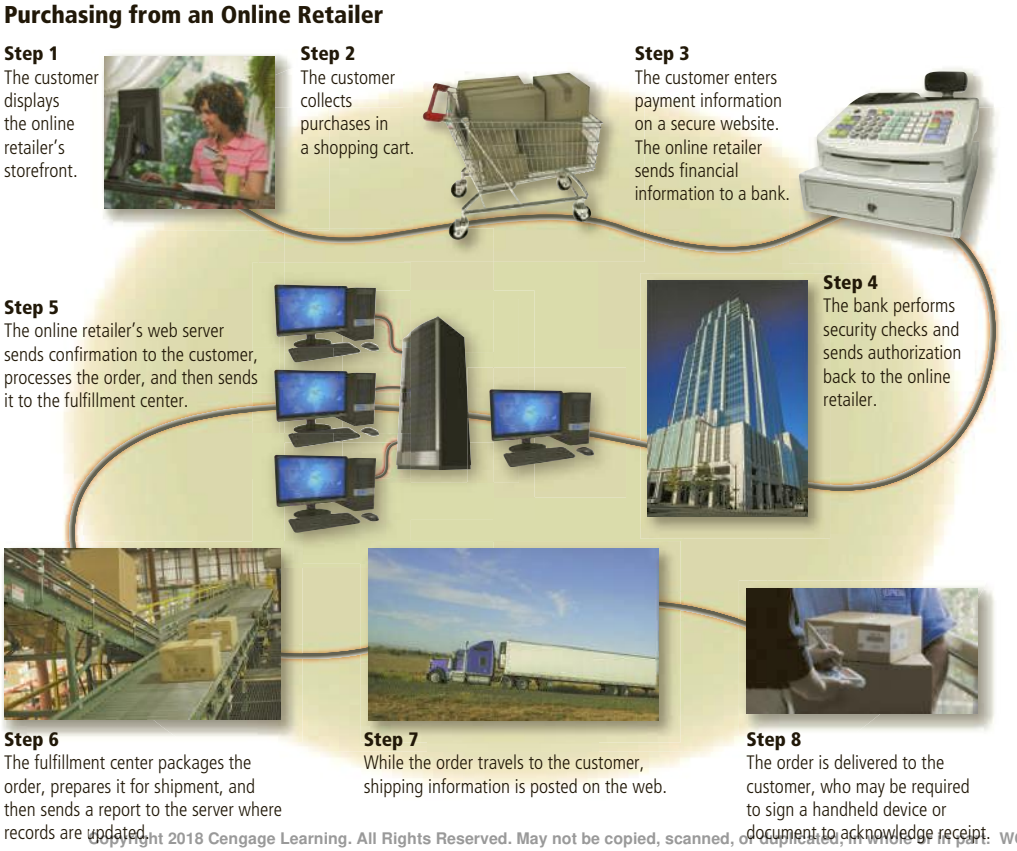

Figure 1-35 This figure shows the steps involved when a customer purchases from an online retailer.

Comstock Images / Getty Images; iStockphoto.com / Mark Evans; iStockphoto.com / AndyL; iStockphoto.com / Mlenny Photography; Oleksiy Mark / Photos.com; Oleksiy Mark / Shutterstock.com.; iStockphoto.com / MotoEd; iStockphoto.com / Oksana Perkins; iStockphoto.com / stevecoleimages

Many mobile apps make your shopping experience more convenient. Some enable you to manage rewards, use coupons, locate stores, or enable mobile payments where you can pay for goods and services directly from your phone or other mobile device. Other mobile apps will check a product's price and availability at stores in your local area or online. Read Secure IT 1-4 for tips about shopping safely online.

SECURE IT 1-4

Shopping Safely Online

Browsing electronic storefronts and making online purchases can be convenient and economical, but the experience can be a disaster if you encounter unscrupulous vendors. These tips can help you enjoy a safe and productive online shopping trip.

- **Read customer reviews.** Shoppers frequently post comments about merchandise quality, pricing, and shipping. Their evaluations may help you decide whether a company is legitimate. Be aware, however, that the Federal Trade Commission has sued companies for posting false positive reviews and that some companies remove negative comments. Make it a habit to rate merchants as often as possible so that others can learn from your experiences.
- **Look for seals of approval.** Online businesses can display seals if they have met rigorous standards. Some unscrupulous merchants, however, will place the seals on their websites even if they have not been approved. To check a seal's legitimacy, click the logo and be certain you are directed to the issuing agency's website to verify the seal is valid.
- **Create a strong password and password questions.** If the merchant requires you to create a user name and password, be certain to develop a long, complex password with at least eight characters that include letters, numbers, and special characters. (Refer to Secure IT 1-3 earlier in this module for guidance on creating a strong password.) The website also may ask for answers to security questions; if so, do not supply information that hackers could locate easily, such as your high school, place of birth, or family members' or pets' names.
- **Check website details.** Locate the vendor's privacy policy to learn how your information will be stored. Also, look for phone numbers, physical addresses, and email addresses to contact the vendor if questions arise about damaged goods or billing discrepancies.
- **Beware of requests to supply further information.** After you have placed an order, you may receive an email message asking you to confirm the transaction or to supply additional account information. A reputable business will not solicit these requests, so do not reply to the message.

Consider This: Have you made online purchases? If so, have you followed the precautions listed here? How will you change your activities the next time you shop online?

Entertainment

You can use computers and mobile devices to listen to audio clips or live audio; watch video clips, television shows, or live performances and events; read a book, magazine, or newspaper; and play a myriad of games individually or with others. In some cases, you download the media from the web to a computer or mobile device so that you can watch, listen to, view, or play later. Some websites support *streaming*, where you access the media content while it downloads. For example, radio and television broadcasts often use streaming media to broadcast music, interviews, talk shows, sporting events, news, and other segments so that you can listen to the audio or view the video as it downloads to your computer. You also can create videos, take photos, or record audio and upload (transfer) your media content to the web to share with others, such as on an online social network.

CONSIDER THIS

Can I make copies of songs or other media that I have purchased and downloaded from a legitimate website, such as iTunes?

You typically can make a copy as a personal backup, but you cannot share the copy with others in any format unless you have legal permission from the copyright owner to do so. That is, you cannot give someone a CD copy, nor can you share a digital file by posting it on the web or sending it as an email message.

Health Care

Nearly every area of health care today uses computers. Whether you are visiting a family doctor for a regular checkup, having lab work or an outpatient test, filling a prescription, or being rushed in for emergency surgery, the medical staff around you will be using computers for various purposes:

- Hospitals and doctors use computers and mobile devices to maintain and access patient records (Figure 1-36).
- Computers and mobile devices monitor patients' vital signs in hospital rooms and at home; patients use computers to manage health conditions, such as diabetes.
- Robots deliver medication to nurses' stations in hospitals.
- Computers and computerized devices assist doctors, nurses, and technicians with medical tests.
- Doctors use the web and medical software to assist with researching and diagnosing health conditions.
- Doctors use email, text messaging, and other communications services to correspond with patients.
- Patients use computers and mobile devices to refill prescriptions, and pharmacists use computers to file insurance claims and provide customers with vital information about their medications.
- Surgeons implant computerized devices, such as pacemakers, that allow patients to live longer.
- Surgeons use computer-controlled devices to provide them with greater precision during operations, such as for laser eye surgery and robot-assisted heart surgery.
- Medical staff use virtual reality (VR) to simulate education and training environments, such as for practicing surgeries, and patients use VR for recovery treatments, such as in rehabilitation and behavior therapy.
- Medical staff create labels for medicine, hospital ID bracelets, and more, enabling staff to verify dosage and access patient records by scanning the label.

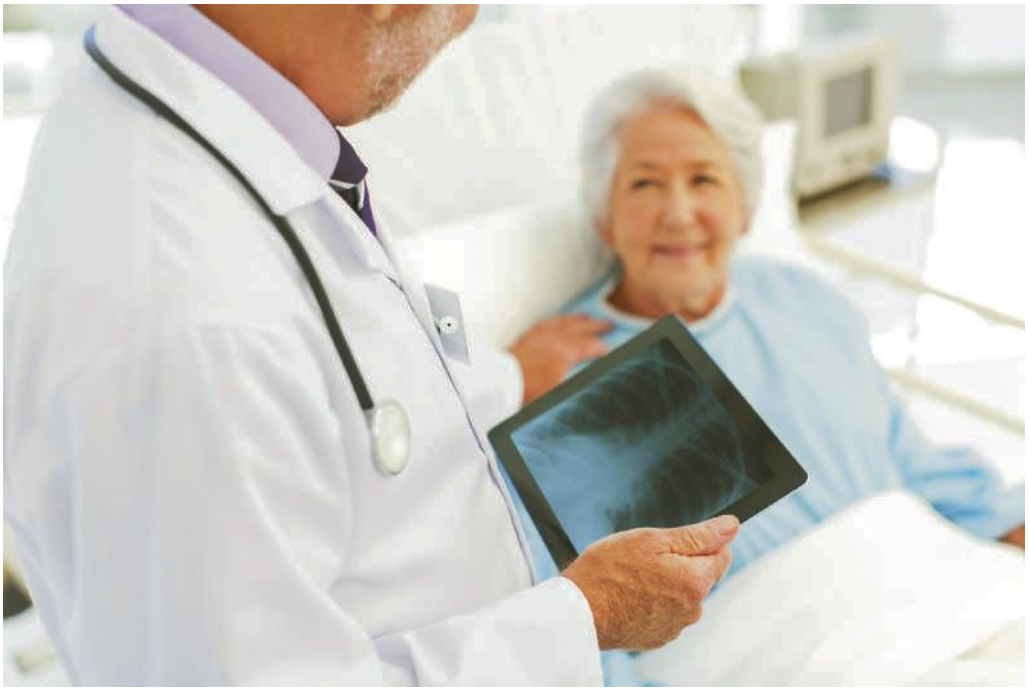

Figure 1-36 Doctors, nurses, technicians, and other medical staff use computers and computerized devices to assist with medical tests.
iStockphoto.com / Neustockimage

Science

All branches of science, from biology to astronomy to meteorology, use computers to assist them with collecting, analyzing, and modeling data. Scientists also use the Internet to communicate with colleagues around the world. Breakthroughs in surgery, medicine, and treatments often result from scientists' use of computers. Tiny computers now imitate functions of the central nervous system, retina of the eye, and cochlea of the ear. A cochlear implant allows a deaf person to distinguish sounds. Electrodes implanted in the brain stop tremors associated with Parkinson's disease.

A *neural network* is a system that attempts to imitate the behavior of the human brain. Scientists create neural networks by connecting thousands of processors together much like the neurons in the brain are connected. The capability of a personal computer to recognize spoken words is a direct result of scientific experimentation with neural networks.

Figure 1-37 Many vehicles include an onboard navigation system.
kaczor58 / Shutterstock.com

Travel

Whether traveling by car or plane, your goal is to arrive safely at your destination. As you make the journey, you may interact with a navigation system or GPS, which uses satellite signals to determine a geographic location. GPS technology also assists people with creating maps, determining the best route between two points, locating a lost person or stolen object, monitoring a person's or object's movement, determining altitude, calculating speed, and finding points of interest. Vehicles manufactured today typically include some type of onboard navigation system (Figure 1-37) or the capability of communicating with a smartphone or other mobile device's built-in navigation system.

In preparing for a trip, you may need to reserve a car, hotel, or flight. Many websites offer these services to the public where you can search for and compare flights and prices, order airline tickets, or reserve a rental car. You also can print driving directions and maps from the web.

Publishing

Many publishers of books, magazines, newspapers, music, film, and video make their works available online. Organizations and individuals publish their thoughts and ideas using a blog, podcast, or wiki.

- A *blog* is an informal website consisting of time-stamped articles (posts) in a diary or journal format, usually listed in reverse chronological order. Posts can contain text, photos, links, and more. For example, Figure 1-38 shows the Nutrition Blog Network, in which registered dietitians post articles about nutrition. As others read articles in your blog, you can enable them to reply with their own thoughts. A blog that contains video is called a video blog.
- Podcasts are a popular way to distribute audio or video on the web. A *podcast* is recorded media that users can download or stream to a computer or portable media player. Examples of podcasts include lectures, political messages, radio shows, and commentaries. Podcasters register their podcasts so that subscribers can select content to automatically download when they are connected.

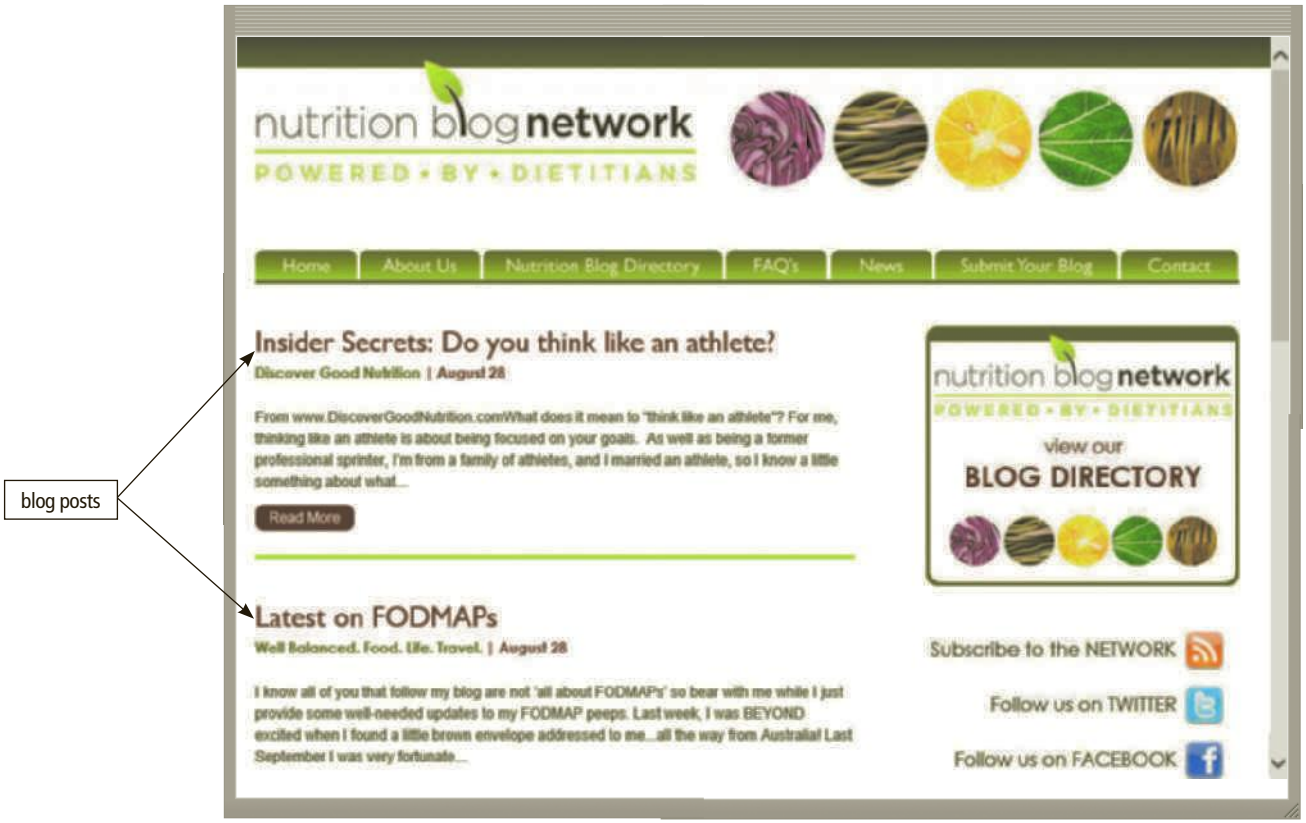

Figure 1-38 Any group or individual can create a blog, so that they can share thoughts and ideas.
Source: Nutrition Blog Network

- A *wiki* is a collaborative website that allows users to create, add to, modify, or delete the content via their browser. Many wikis are open to modification by the general public. The difference between a wiki and a blog is that users cannot modify original posts made by a blogger. Read Ethics & Issues 1-3 for an issue related to using wikis as a source for research.

ETHICS & ISSUES 1-3

Should Wikis Be Allowed as Valid Sources for Academic Research?

As wikis have grown in number, size, and popularity, many educators and librarians have shunned them as valid sources of research. While some wikis are tightly controlled with a limited number of contributors and expert editors, these wikis usually focus on narrowly defined, specialized topics. Most large, multi-topic online wikis, such as Wikipedia, often involve thousands of editors, many of whom remain anonymous.

Critics of wikis cite the lack of certified academic credentials by the editors, as well as potential political or gender bias by contributors. Wikis also are subject to vandalism. Vandals' motives vary; some enter false information to discredit the wiki and others for humorous results. On occasion, rival political factions have falsified or embellished wiki entries in an attempt to give their candidate an advantage. Some wiki supporters argue that most wikis provide adequate controls to correct false or misleading content quickly and to punish those who submit it. One popular wiki now requires an experienced editor to verify changes made to certain types of articles. Other wiki protection methods include locking articles from editing, creating a list of recently edited articles, enabling readers to report vandalism, and allowing people to be notified about changes to a wiki page that they have edited or that is about them. Some proponents propose that people should use wikis as a starting point for researching a fact, but that they should verify the fact using traditional sources.

Consider This: Should instructors allow wikis as valid sources for academic research? Why or why not? Would you submit a paper to your instructor that cites a wiki as a source? Why or why not? What policies might wikis enforce that could garner more confidence from the public? If a wiki provided verification of the credentials of the author, would you trust the wiki more? Why or why not?

Figure 1-39 Automotive factories use industrial robots to weld car bodies.
Betastock / Shutterstock.com

Manufacturing

Computer-aided manufacturing (CAM) refers to the use of computers to assist with manufacturing processes, such as fabrication and assembly. Industries use CAM to reduce product development costs, shorten a product's time to market, and stay ahead of the competition. Often, robots carry out processes in a CAM environment. CAM is used by a variety of industries, including oil drilling, power generation, food production, and automobile manufacturing. Automobile plants, for example, have an entire line of industrial robots that assemble a car (Figure 1-39).

Special computers on the shop floor record actual labor, material, machine, and computer time used to manufacture a particular product. The computers process this data and automatically update inventory, production, payroll, and accounting records on the company's network.

Technology Users

Every day, people around the world use various technologies at home, at work, and at school. Depending on the hardware, software, and communications requirements, these users generally can be classified in one of five categories. Keep in mind that a single user may fall into more than one category.

- A *home user* is any person who spends time using technology at home. Parents, children, teenagers, grandparents, singles, couples, etc., are all examples of home users.
- A *small/home office user* includes employees of companies with fewer than 50 employees, as well as the self-employed who work from home. Small offices include local law practices, accounting offices, travel agencies, and florists.
- A *mobile user* includes any person who works with computers or mobile devices while away from a main office, home, or school. Examples of mobile users are sales representatives, real estate agents, insurance agents, meter readers, package delivery people, journalists, consultants, and students.
- A *power user* is a user who requires the capabilities of a powerful computer. Examples of power users include engineers, scientists, architects, game designers, and graphic artists.
- An enterprise has hundreds or thousands of employees or customers who work in or do business with offices across a region, the country, or the world. Each employee or customer who uses computers, mobile devices, and other technology in the enterprise is an *enterprise user*.

Table 1-4 illustrates the range of hardware, programs/apps, and communications forms used in each of these categories.

Table 1-4 Categories of Users

User	Sample Hardware	Sample Desktop Apps	Sample Mobile or Web Apps	Forms of Communications
All Users 	Smartphone Digital camera Printer	Word processing Schedule and contact management Browser Security	Alarm clock Calculator News, weather, sports Reference Finance	Email Online social networks Blogs
Home User 	Laptop, tablet, or desktop Portable media player and earbuds or headphones Game console E-book reader Wearable device Webcam Headset	Personal finance Photo and video editing Media player Educational Entertainment	Banking Travel Mapping Navigation Health and fitness Retail Media sharing Educational	Messaging VoIP
Small/Home Office User 	Desktop(s) or laptop(s) Server Webcam Scanner	Spreadsheet Database Accounting	Travel Mapping	Messaging VoIP FTP
Mobile User 	Laptop or tablet Video projector Wireless headset	Note taking Presentation Educational Entertainment	Travel Mapping Navigation Retail Educational	
Power User 	Desktop Scanner	Desktop publishing Multimedia authoring Computer-aided design Photo, audio, video editing		FTP Videoconferencing
Enterprise User 	Server Desktop(s) or laptop(s) Industry-specific handheld computer Webcam Scanner	Spreadsheet Database Accounting	Travel Mapping Navigation	Messaging VoIP FTP Videoconferencing

iStockphoto.com / Joshua Hodge Photography; Elena Elisseeva / Shutterstock.com; Monkey Business Images / Shutterstock.com; iStockphoto.com / Stuart Jenner; Chuck Rausin / Shutterstock.com; Monkey Business Images / Shutterstock.com

Summary

Module 1 introduced you to basic computer concepts. You learned about laptops, tablets, desktops, servers, smartphones, digital cameras, portable media players, e-book readers, and game devices. The module introduced various methods for input, output, memory, and storage. It discussed the Internet, browsing and searching the web, and online social networks. Next, the module introduced digital security and safety risks and precautions, along with various types of programs, applications, communications, and networks. The many different uses of technology applications in society also were presented, along with types of users. This module is an overview. Many of the terms and concepts introduced will be discussed further in later modules.

STUDENT ASSIGNMENTS

Study Guide

The Study Guide reinforces material you should know after reading this module.

Instructions: Answer the questions below using the format that helps you remember best or that is required by your instructor. Possible formats may include one or more of these options: write the answers; create a document that contains the answers; record answers as audio or video using a webcam, smartphone, or portable media player; post answers on a blog, wiki, or website; or highlight answers in the book/e-book.

1. Define the term, digital literacy.
2. Define the terms, computer, hardware, and user.
3. Differentiate between a PC and a mobile computer. A laptop also is known as a(n) ___ computer.
4. Describe the characteristics and features of a tablet. List several touch screen gestures.
5. Explain the difference between a desktop and an all-in-one. What additional meaning does the term, desktop, sometimes have?
6. Define the term, server. What services does a server provide?
7. Explain whether or not a mobile device is a computer.
8. List characteristics of a smartphone.
9. Differentiate among voice mail, text, picture, and video messages.
10. Describe the purpose of these mobile devices: digital cameras, portable and digital media players, e-book readers, wearable devices, and game devices.
11. Describe the trend of digital device convergence and how it applies to mobile devices.
12. Describe uses of technology in home automation.
13. Differentiate between data and information. Give an example of each.
14. Define the terms, input and output. List several types of input devices and output devices.
15. Describe the purpose of a pointing device. Give an example.
16. List the hardware you can use to input and view output for voice and video.
17. Differentiate between memory and storage.
18. A computer keeps data, instructions, and information on ___ media. Give some examples.
19. Define the term, cloud storage. Describe the types of services offered by cloud storage providers.
20. Describe components of a backup plan. How do backup plans for mobile devices and personal computers differ?
21. Differentiate between the web and the Internet.
22. Describe the Internet. Define the Internet of Things. Identify reasons people use the Internet.
23. The ___ consists of a worldwide collection of electronic documents. What is each electronic document called?
24. What is a browser? Describe the purpose of a search engine.
25. Explain the purpose of an online social network.
26. Differentiate between the services and uses of Facebook, Twitter, and LinkedIn.
27. List services of the Internet that facilitate communications.
28. Define the term, malware. List ways you can protect yourself from malware.
29. What privacy risks are involved with using technology? List guidelines for creating a strong password.
30. Explain physical and behavioral health risks associated with using computers.
31. Describe strategies that support green computing.
32. Define the term, software. Software also is called a(n) ___.
33. Define the term, operating system. List popular operating systems for computers and mobile devices.
34. Differentiate between desktop, web, and mobile apps.
35. What is the role of a software developer?
36. Define the term, communications device. List examples of wireless communications technologies.
37. Define the term, hot spot.
38. Describe how homes and businesses use networks.
39. Explain what occurs when you synchronize computers and mobile devices.
40. Describe crowdsourcing with respect to technology.
41. List ways that schools use technology to enhance education.
42. Identify how the following industries use technology: government, financial, retail, entertainment, health care, science, travel, publishing, and manufacturing.
43. Describe how you might use blogs, podcasts, and wikis to publish content.
44. Differentiate among the following technology user types: home user, small/home office user, mobile user, power user, and enterprise user.

Key Terms

You should be able to define the Primary Terms and be familiar with the Secondary Terms listed below.

Primary Terms (shown in **bold-black** characters in the module)

all-in-one (1-5)
app (1-25)
application (1-25)
backup (1-16)
Bluetooth (1-28)
browser (1-19)
cloud storage (1-16)
communications device (1-28)
computer (1-3)
desktop (1-5)
digital camera (1-7)
digital device convergence (1-9)
e-book reader (1-8)
game console (1-8)
green computing (1-24)
hard drive (1-15)
input device (1-10)
Internet (1-17)
laptop (1-3)
memory (1-15)
network (1-5)
online social network (1-21)
output device (1-13)
portable media player (1-7)
printer (1-13)
program (1-24)
search engine (1-20)
server (1-5)
smartphone (1-6)
software (1-24)
storage device (1-15)
storage media (1-15)
sync (1-30)
synchronize (1-30)
tablet (1-3)
wearable device (1-8)
web (1-18)
web server (1-18)
webpage (1-18)
website (1-18)
Wi-Fi (1-28)

Secondary Terms (shown in *italic* characters in the module)

3-D printer (1-13)
blog (1-36)
click (1-12)
computer-aided manufacturing (1-38)
crowdsourcing (1-31)
data (1-10)
desktop app (1-26)
digital literacy (1-3)
digital media (1-7)
digital media player (1-7)
double-click (1-12)
double-tap (1-4)
downloading (1-18)
drag (1-4, 1-12)
earbuds (1-7)
e-book (1-8)
enterprise user (1-38)
e-reader (1-8)
e-waste (1-24)
file (1-16)
gesture (1-4)
hard copy (1-13)
hard disk (1-15)
hardware (1-3)
headset (1-13)
home user (1-38)
hot spot (1-28)
hyperlink (1-18)
information (1-10)
input (1-3)
keyboard (1-11)
link (1-18)
loads (1-26)
malware (1-22)
memory card (1-16)
microphone (1-13)
mobile app (1-26)
mobile computer (1-3)
mobile device (1-5)
mobile user (1-38)
mouse (1-12)
neural network (1-36)
notebook computer (1-3)
operating system (1-24)
optical disc (1-16)
output (1-3)
personal computer (1-3)
picture message (1-6)
pinch (1-4)
podcast (1-36)
point (1-12)
power user (1-38)
press and hold (1-4)
printout (1-13)
resources (1-29)
right-click (1-12)
scanner (1-13)
slide (1-4)
small/home office user (1-38)
Smart TV (1-14)
social networking site (1-21)
software developer (1-26)
solid-state drive (1-15)
streaming (1-34)
streaming media player (1-7)
stretch (1-4)
surfing the web (1-19)
swipe (1-4)
tap (1-4)
text message (1-6)
touchpad (1-12)
USB flash drive (1-16)
user (1-3)
user interface (1-26)
video message (1-6)
voice mail message (1-6)
wearable (1-8)
web address (1-19)
web app (1-26)
webcam (1-13)
wiki (1-37)

Courtesy of Apple Inc.

Checkpoint

The Checkpoint exercises test your knowledge of the module concepts.

True/False

Mark T for True and F for False. If False, rewrite the statement so that it is True.

_____ 1. Although some forms of memory are permanent, most memory keeps data and instructions temporarily, meaning its contents are erased when the computer is turned off.

_____ 2. An all-in-one contains a separate tower.

_____ 3. A smartphone is a small, mobile computing consumer device designed to be worn.

_____ 4. Data conveys meaning to users, and information is a collection of unprocessed items, which can include text, numbers, images, audio, and video.

_____ 5. Earbuds are a type of input device.

_____ 6. A scanner is a light-sensing output device.

_____ 7. One way to protect your computer from malware is to scan any removable media before using it.

_____ 8. A solid-state drive contains one or more inflexible, circular platters that use magnetic particles to store data, instructions, and information.

_____ 9. The terms, web and Internet, are interchangeable.

_____ 10. Electronic components in computers process data using instructions, which are the steps that tell the computer how to perform a particular task.

_____ 11. Operating systems are a widely recognized example of system software.

_____ 12. You usually do not need to install web apps before you can run them.

Matching

Match the terms with their definitions.

_____ 1. all-in-one

_____ 2. digital device convergence

_____ 3. file

_____ 4. Internet of Things

_____ 5. operating system

_____ 6. server

_____ 7. software

_____ 8. solid-state drive

_____ 9. storage device

_____ 10. touchpad

a. term that describes the trend of computers and devices with technologies that overlap

b. small, flat, rectangular pointing device that is sensitive to pressure and motion

c. series of related instructions, organized for a common purpose, that tells the computer what tasks to perform and how to perform them

d. component that records and/or retrieves items to and from storage media

e. storage device that typically uses flash memory to store data, instructions, and information

f. everyday devices and objects equipped with sensors that transmit data to and from the Internet

g. computer that is dedicated to providing one or more services to other computers or devices on a network

h. type of desktop computer that does not contain a tower and instead uses the same case to house the display and the processing circuitry

i. named collection of stored data, instructions, or information

j. set of programs that coordinates all the activities among computer or mobile device hardware

Problem Solving

The Problem Solving exercises extend your knowledge of module concepts by seeking solutions to practical problems with technology that you may encounter at home, school, or work. The Collaboration exercise should be completed with a team.

Instructions: You often can solve problems with technology in multiple ways. Determine a solution to the problems in these exercises by using one or more resources available to you (such as a computer or mobile device, articles on the web or in print, blogs, podcasts, videos, television, user guides, other individuals, electronics or computer stores, etc.). Describe your solution, along with the resource(s) used, in the format requested by your instructor (brief report, presentation, discussion, blog post, video, or other means).

Personal

1. **Shopping for Software** You are shopping for software that will assist you with your home's interior design. The package for the program you would like to purchase states that it was designed for the most recent version of Windows, but an older version is installed on your computer. How can you determine whether the program will run on your computer?
2. **Bad Directions** You are driving to your friend's house and are using your smartphone for directions. While approaching your destination, you realize that your smartphone app instructed you to turn the wrong way on your friend's street. How could this have happened?
3. **Bank Account Postings** While reviewing your checking account balance online, you notice that debit card purchases have not posted to your account for the past several days. Because you use online banking to balance your account, you become concerned about your unknown account balance. What steps will you take to correct this situation?
4. **Trial Expired** You have been using an app on your mobile device for a 30-day trial period. Now that the 30 days have expired, the app is requesting that you to pay to continue accessing your data. What are your next steps? What steps could you have taken to preserve your data before the trial period expired?
5. **Problematic Camera** After charging your digital camera battery overnight, you insert the battery and turn on the camera only to find that it is reporting a low battery. Seconds later, the camera shuts off automatically. What might be wrong?

Professional

6. **Discarding Old Computer Equipment** Your company has given you a new laptop to replace the outdated desktop you have been using. Because of the negative environmental impact of discarding the old computer in the trash, your supervisor asked you to suggest options for its disposal. How will you respond?
7. **Dead Battery** While traveling for business, you realize that you forgot to bring the battery charger for your laptop. Knowing that you need to use the laptop to deliver a presentation tomorrow, what steps will you take tonight to make sure you have enough battery power?
8. **Cannot Share Photos** You are attempting to send photos of a house for sale in an email message to your real estate partner. Each time you attempt to send the email message, you receive an automatic response stating that the files are too large. What are your next steps?
9. **Incorrect Sign-In Credentials** Upon returning to the office from a well-deserved, two-week vacation, you turn on your computer. When you enter your user name and password, an error message appears stating that your password is incorrect. What are your next steps?
10. **Synchronization Error** You added appointments to the calendar on your computer, but these appointments are not synchronizing with your smartphone. Your calendar has synchronized with your smartphone in the past, but it has stopped working without explanation. What are your next steps?

Collaboration

11. **Technology in Health Care** Your primary care physician is moving from a shared office so that he can open his own practice. He mentioned that he would like to use technology in his office that not only will improve the patient experience, but also make his job easier. Form a team of three people to determine the types of technology your physician can use in his new office. One team member should research ways that technology can help improve patient check-in and billing. Another team member should research the types of technology your physician can use while he is working with patients, and the third team member should research any additional technology that can be used in the office to improve the patient experience.

STUDENT ASSIGNMENTS

How To: Your Turn

The How To: Your Turn exercises present general guidelines for fundamental skills when using a computer or mobile device and then require that you determine how to apply these general guidelines to a specific program or situation.

Instructions: You often can complete tasks using technology in multiple ways. Figure out how to perform the tasks described in these exercises by using one or more resources available to you (such as a computer or mobile device, articles on the web or in print, online or program help, user guides, blogs, podcasts, videos, other individuals, trial and error, etc.). Summarize your 'how to' steps, along with the resource(s) used, in the format requested by your instructor (brief report, presentation, discussion, blog post, video, or other means).

1 Sign Up for a Microsoft Account

A Microsoft account provides access to several Microsoft services. These services include access to resources, such as a free email account, cloud storage, a location to store information about your contacts, and an online calendar. You will need a Microsoft account to complete some of the exercises in this book. The following steps guide you through the process of signing up for a Microsoft account.

a. Run a browser and navigate to www.outlook.com.
b. Click the link and then follow the on-screen instructions to sign up for a free Microsoft account.
c. Browse the resources available to you in your Microsoft account.
d. If assigned by your instructor, compose and send a new email message from your Microsoft account to your instructor stating that you have signed up for a Microsoft account successfully.
e. Add your instructor's contact information. Next, add contact information for at least three more people.
f. Add your birthday to the calendar.
g. Edit your Microsoft account profile to add more contact and work information.

Exercises

1. If necessary, navigate to and view your new outlook.com email account. What are some ways to prevent junk email messages using the mail settings? What is junk email?
2. What is OneDrive? How much space do you have available on OneDrive to post files?
3. How can you see yourself using the various features in your newly created Microsoft account?

2 Connect to a Wireless Network

Wireless networks are available in many homes and businesses. Connecting to a wireless network can provide you with high-speed access to the Internet and other network resources. The following steps guide you through the process of connecting to a wireless network from a computer or mobile device.

a. If necessary, turn on your computer or mobile device and make sure wireless functionality is enabled.
b. Obtain the name of the wireless network to which you want to connect. **Note:** *You should connect only to wireless networks for which you have permission.*
c. On your computer or mobile device, view the list of available wireless networks.
d. Select the wireless network to which you want to connect.
e. If necessary, enter the requested security information, such as an encryption key or a password.
f. Run a browser to test your connection to the wireless network.

Exercises

1. Why should you not connect to a wireless network unless you have permission?
2. What is the name of the wireless network to which you connected?
3. Why might you connect to a wireless network on your smartphone instead of using your mobile data plan?

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