

APPENDIX A

COMPUTER CONCEPTS

What Is a Computer?

A computer is a machine that is used to store, retrieve, and manipulate data. A computer takes **input**, uses stored instructions to **process** and store that data, and then produces **output**. You enter the data into the computer through a variety of input devices, such as a keyboard or mouse. The processor processes the data to produce information. Information is output or presented in many ways such as an image on a screen or a monitor; printed pages from a printer, or sound through speakers. Computer **software** is the stored instructions or programming that runs the computer. **Memory** inside the computer stores the programs or instructions that run the computer as well as the data and information. Various **storage devices** are used to transfer or safely store the data and information.

A **computer system** is made up of components that include the computer, input, and output devices. Computer systems come in many shapes, sizes, and configurations. The computer you use at home or in school is often called a **personal computer**. See Figure A-1. **Desktop computers** often have a 'computer case' or a **system unit**, which contains processing devices, memory, and some storage devices.

FIGURE A-1

Example of a computer system



Input devices such as the mouse and keyboard are attached to the system unit by cables or wires. Output devices, such as the monitor, speakers, and printer are also attached to the system unit by cables or wires. **Wireless technology** makes it possible to eliminate wires and use the airwaves to connect devices. **Laptop** or **notebook** computers have all the essential parts in one unit.

The **operating system** is the main software or **system software** that runs a computer and often defines the type of computer. There are two main types or platforms for personal computers. The Macintosh computer, or Mac, is produced by Apple Computer, Inc. and runs the Mac operating system. The PC is a Windows-based computer produced by many different companies, but which runs the Microsoft Windows operating system.

Hardware

The physical components, devices, or parts of the computer are called **hardware**. The main parts are the central processing unit (CPU), the monitor, the keyboard, and the mouse. Peripherals are additional components, such as printers and scanners. Peripherals are not essential to the computer but enhance the computer.

Input Devices

There are many different types of input devices. You enter information into a computer by typing on a keyboard or by pointing, clicking, or dragging a mouse. A **mouse** is a hand-held device used to move a pointer on the computer screen. Similar to a mouse, a **trackball** has a roller ball that turns to control a pointer on the screen. Digital tracking devices, such as a **touchpad**, are an alternative to the trackball or mouse. Situated on the keyboard of a laptop computer, they allow you to simply move and tap your finger on a small electronic pad to control the pointer on the screen.

Tablet PCs allow you to input data by writing directly on the computer screen. Handwriting recognition technology converts handwritten writing to text. Many computers have a microphone or other **sound input device** which accepts speech or sounds as input and converts the speech to text or data. For example, when you telephone a company or bank for help and have the option to say your requests or account number, this is **speech recognition technology** at work!

Other input devices include scanners and bar code readers. You can use a **scanner** to convert text or graphics from a printed page into code that a computer can process. You have probably seen **bar code readers** being used in stores. These are used to read bar codes, such as the UPC (universal product code), to track merchandise or other inventory in a store. See Figure A-2.

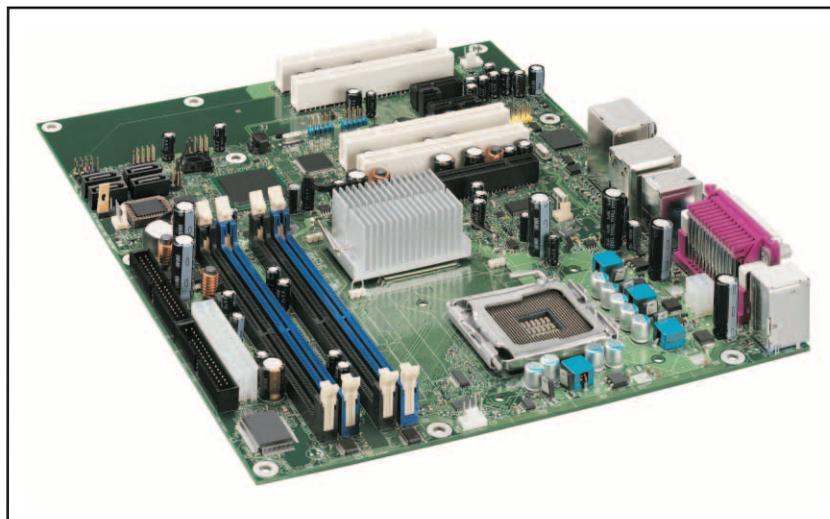
FIGURE A-2
Examples of input devices



Processing Devices

Processing devices are mounted inside the system unit of the computer. The **central processing unit (CPU)** is a silicon chip that processes data and carries out instructions given to the computer. The **data bus** includes the wiring and pathways by which the CPU communicates with the peripherals and components of the computer. The CPU is stored on the motherboard of the computer. The **motherboard** is where the computer memory and other vital electronic parts are stored. See Figure A-3.

FIGURE A-3
A motherboard



Storage Devices

A **storage device** is used to store data on a computer. Storage devices are both input and output devices. Most computers have more than one type of storage device. The main storage device for a computer is the **hard disk drive** that is usually inside the system unit. See Figure A-4. It is fixed storage, not removable from the computer. External and removable hard disk drives are available that can plug into the USB port on the system unit. The hard disk drive reads and writes data to and from a round magnetic platter, or disk. The data is digitally encoded on the disk as a series of 1s and 0s. A **byte** stands for a single character of data. At the time this book was written, typical hard drives for a computer system that you might buy for your personal home use range from 80 gigabytes (GB) to 250 gigabytes. The prefix “giga” means a billion. A gigabyte (GB or Gbyte) is approximately one billion bytes.

FIGURE A-4

A hard disk drive



The **floppy disk drive** is an older technology that is no longer available on new computers. Some older computers still have a floppy disk drive which is mounted in the system unit with access to the outside. A floppy disk is the medium that stores the data. You put the floppy disk into the floppy disk drive so the computer can read and write the data. The floppy disk’s main advantage was portability. You can store data on a floppy disk and transport it for use on another computer. A floppy disk can hold up to 1.4MB (megabytes) of information. A Zip disk is similar to a floppy disk. A **Zip disk** is also a portable disk contained in a plastic sleeve, but it will hold 100MB or 250MB of information. A special disk drive called a **Zip drive** is required to read and write data to a Zip disk.

Another storage device is the **CD drive** or **DVD drive**. These drives are typically mounted inside the system unit, although external versions of these devices are also available. Most new computers are equipped with CD/DVD burners. That means they have read and write capabilities. You use a CD/DVD drive to read and write CDs and DVDs. A **CD** is a compact disc, which is a form of optical storage. Compact discs can store 650MB. These discs have a great advantage over other forms of removable storage as they can hold vast quantities of information—the entire contents of a small library, for instance. They are also fairly durable. Another advantage of CDs is their ability to hold graphic information, including moving pictures, with the highest quality stereo sound. A **DVD** is also an optical disc that looks like a CD. It is a high-capacity storage device that can contain up to 4.7GB of data, which is a seven-fold increase over a CD. There are two variations of DVDs that offer even more storage—a 2-layer version with 9.4GB capacity and double-sided discs with 17GB capacity. Newer versions store even more data. These highest-capacity discs are designed to store large databases. A DVD holds 133 minutes of data on each side, which means that two two-hour full-length feature movies can be stored on one disc. Information is encoded on the disk by a laser and read by a CD/DVD drive in the computer.

Solid state storage is another popular storage technology. A **USB flash drive** is a very portable small store device that works both as a drive and medium. It plugs directly into a USB port on the computer system unit. You read and write data to the flash drive. **Solid state card readers** are devices that can read solid state cards. Solid state storage is often used in cameras.

Magnetic tape is a medium most commonly used for backing up a computer system, which means making a copy of files from a hard drive. Although it is relatively rare for a data on a hard drive to be completely lost in a crash (that is, for the data or pointers to the data to be partially or totally destroyed), it can and does happen. Therefore, most businesses and some individuals routinely back up files on tape. If you have a small hard drive, you can use DVDs or CD-ROMs to back up your system. Figure A-5 shows removable storage media and devices.

FIGURE A-5
Removable storage

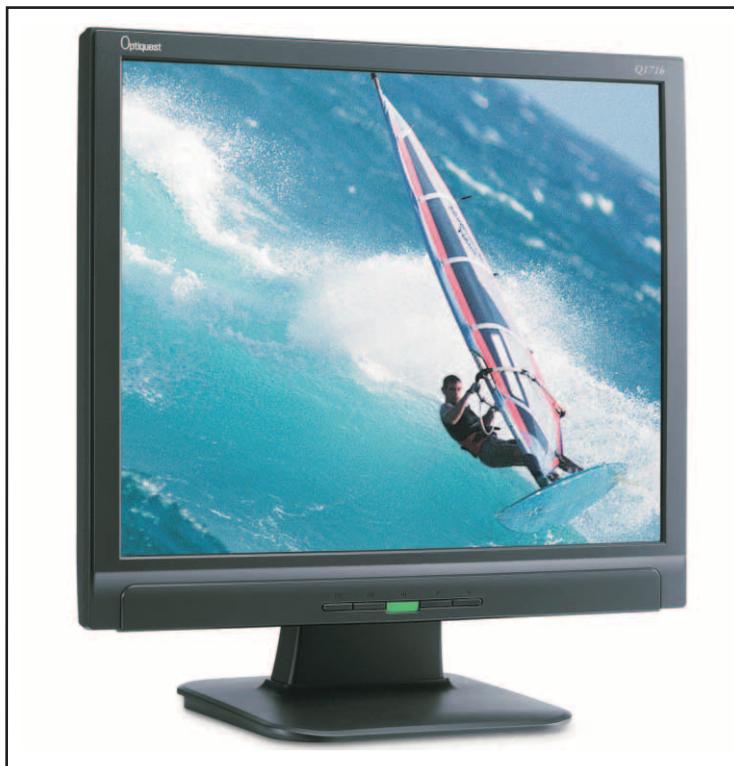


Output Devices

The **monitor** on which you view your computer work is an output device. It provides a visual representation of the information stored in or produced by your computer. The typical monitor for today's system is a flat-screen monitor similar to a television. See Figure A-6. It provides a very sharp picture because of the large number of tiny dots, called **pixels**, which make up the display as well as its ability to present the full spectrum of colors. **Resolution**, the term that tells you how clear an image will be on the screen, is measured in pixels. A typical resolution is 1024×768 . A high-quality monitor may have a resolution of 1680×1050 . Monitors come in different sizes. The size of a monitor is determined by measuring the diagonal of the screen. Laptops have smaller monitors than desktop computers. A laptop monitor may be 13", 15", or 17". Desktop monitors can be as large as 19" - 24" or even larger.

FIGURE A-6

A flat screen monitor



Printers are a type of output device. They let you produce a paper printout of information contained in the computer. Today, most printers use either inkjet or laser technology to produce high-quality print. Like a copy machine, a **laser printer** uses heat to fuse a powdery substance called **toner** to the page. **Ink-jet printers** use a spray of ink to print. Laser printers give the sharpest image and often print more pages per minute (ppm) than ink jet printers. Ink-jet printers provide nearly as sharp an image, but the wet printouts can smear when they first are printed. Most color printers, or photo printers for printing photographs, are ink jet printers. Color laser printers are more costly. These printers allow you to print information in a full array of colors, just as you see it on your monitor. See Figure A-7.

FIGURE A-7
Typical printers

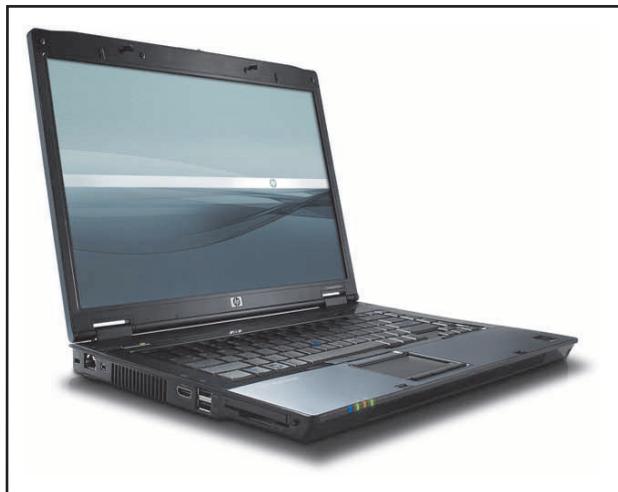


Laptop or Notebook Computer

A **laptop computer**, also called a **notebook computer**, is a small folding computer that can literally fit in a person's lap or in a backpack. Within the fold-up case of a laptop is the CPU, data bus, monitor (built into the lid), hard drive (sometimes removable), 3.5-inch floppy drive, CD/DVD drive, and trackball or digital tracking device. The advantage of the laptop is its portability—you can work anywhere because you can use power either from an outlet or from the computer's internal, rechargeable batteries. Almost all laptops have wireless Internet access built into the system. The drawbacks are the smaller keyboard, smaller monitor, smaller capacity, and higher price, though newer laptops offer full-sized keyboards and higher quality monitors. As technology allows, storage capacity on smaller devices is making it possible to offer laptops with as much power and storage as a full-sized computer. See Figure A-8.

FIGURE A-8

A laptop or notebook computer



Personal Digital Assistants (PDA)

A Personal Digital Assistant is a pocket-sized electronic organizer that helps you to manage addresses, appointments, expenses, tasks, and memos. The common input devices for PDAs include touch-sensitive screens that accept input through a stylus pen or small keyboards that are either built in to the PDA or available as software on the screen. PDA data and information can be shared with a Windows-based or Macintosh computer through a process called synchronization. By placing your PDA in a cradle or through a USB port attached to your computer, you can transfer data from your PDA's calendar, address book, or memo program into your computer's information manager program and vice versa. The information is updated on both sides, making your PDA a portable extension of your computer. PDAs are becoming more and more functional. Newer PDAs include cameras and have cell phone capability. Depending on the amount of memory in the specific PDA, they can include many of the same programs found on a personal computer.

FIGURE A-9
A Personal Digital Assistant



How Computers Work

All of the input, processing, storage, and output devices function together to make the manipulation, storage, and distribution of data and information possible.

Data and Information Management

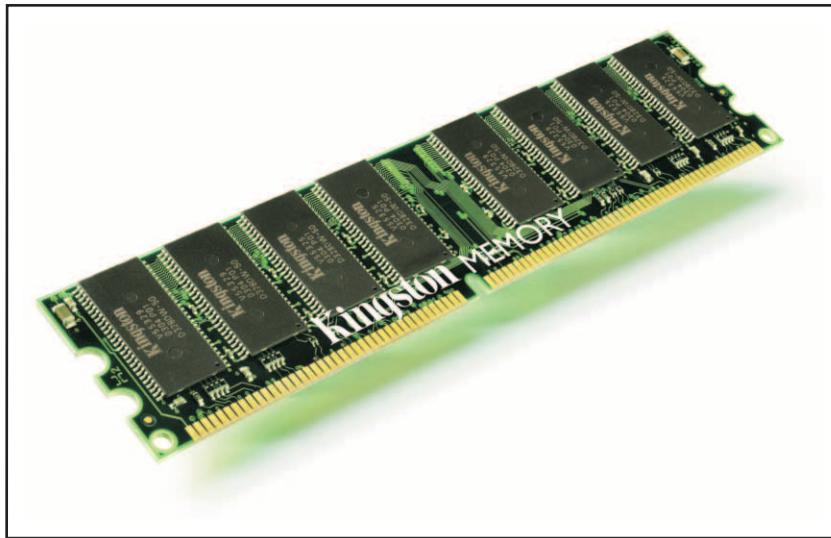
Data is information entered into and manipulated or processed within a computer. Processing includes computation, such as adding, subtracting, multiplying, and dividing; analysis planning, such as sorting data; and reporting, such as presenting data for others in a chart or graph.

Memory

Computers have two types of memory—RAM and ROM. **RAM**, or **random access memory**, is the silicon chips in the system unit that temporarily store information when the computer is turned on. RAM is what keeps the software programs up and running and provides visuals that appear on your screen. You work with data in RAM up until you save it to a storage media device such as a hard disk, CD, DVD, or solid state storage such as flash drive.

Computers now have sophisticated application programs that tend to include a lot of graphics and data. In order to run these programs, computers require a lot of memory. Therefore, computers have at least 512MB of RAM to start. Many computer systems are expandable and you can add on RAM after you buy the computer. The more RAM available for the programs, the faster and more efficiently the machine will be able to operate. RAM chips are shown in Figure A-10.

FIGURE A-10
RAM chips



ROM, or **read-only memory**, is the memory that stays in the computer when it is turned off. It is ROM that stores the programs that run the computer as it starts or “boots up.” ROM holds the instructions that tell the computer how to begin to load its operating system software programs.

Speed

The speed of a computer is measured by how fast the computer processes each instruction. There are several factors that affect the performance of a computer: the speed of the processor, or the **clock speed**, the **front side bus speed**—the speed of the bus that connects the processor to main memory—the speed in which data is written and retrieved from the hard drive or other storage media, and the speed of the graphics card if you are working on programs that use a lot of graphic images. These all factor into a computer’s performance.

The speed of a computer is measured in **megahertz (MHz)** and **gigahertz (GHz)**

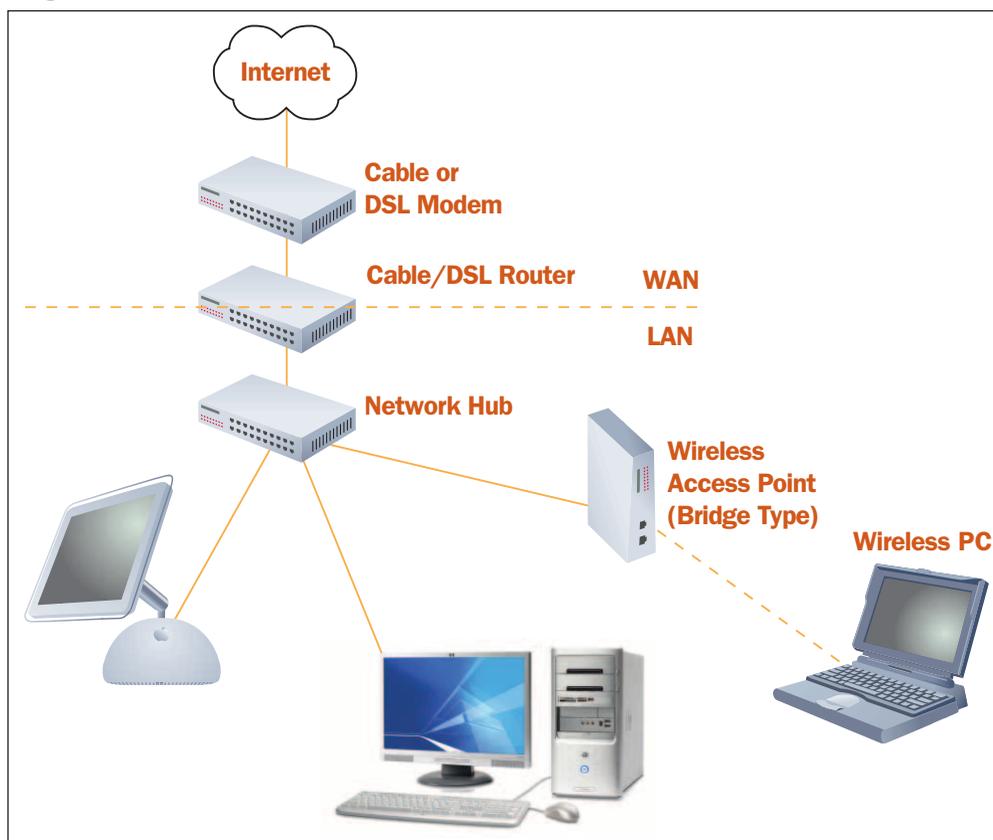
Processors are sold now by name, and each brand or series has its own specifications. Processor manufacturers include Intel, Motorola, and AMD. When you research processors and computers you might see names such as Intel® Core™2 Extreme Processor QX6800, Intel® Core™2 Duo Processor E6700, Pentium® 4 Processor Extreme Edition supporting Hyper-Threading Technology for PCs, or AMD Mobile Athlon or Turion 64 X2. For Macs you might see PowerPC G5 or Xeon 5300.

Networks

Computers have expanded the world of communications. A **network** is defined as two or more computers connected to share data. **LANs (local area networks)** connect computers within a small area such as a home, office, school, or building. Networks can be wired or wireless. The **Internet** is the largest network in the world connecting millions of computers across the globe. Using the Internet, people can communicate across the world instantly.

Networks require various communication devices and software. **Modems** allow computers to communicate with each other by telephone lines. Modem is an acronym that stands for “MODulator/DEModulator.” Modems convert data in bytes to sound media in order to send data over the phone lines and then convert it back to bytes after receiving data. Modems operate at various rates or speeds. **Network cards** in the system unit allow computers to access networks. A **router** is an electronic device that joins two or more networks. For example, a home network can use a router and a modem to connect the home’s LAN to the Internet. A **server** is the computer hardware and software that “serves” the computers on a network. Network technology is sometimes called “client-server.” A personal computer that requests data from a server is referred to as a **client**. The computer that stores the data is the **server**. On the Internet, the computer that stores the Web pages is the **Web server**. Figure A-11 shows a network diagram.

FIGURE A-11
Diagram of a network



Networks have certain advantages over stand-alone computers: they allow communication among the computers; they allow smaller capacity computers to access the larger capacity of the server computers on the network; they allow several computers to share peripherals, such as one printer; and they can make it possible for all computers on the network to have access to the Internet.

Connect to the Internet

To connect to the Internet you need to subscribe to an **Internet Service Provider (ISP)**. There are several technologies available. Connection speeds are measured in bits per second. Upload speeds are slower than download speeds. **Dial-up** is the oldest, and the slowest, Internet access technology and offered by local telephone companies. To get access to the Internet, your computer has to dial out through a phone line. Many people have moved to **always-on connection technologies**. The computer is always connected to the Internet if you turn the computer on, so you don't have to dial out. These always-on faster technologies, known as **Digital Subscriber Line (DSL)**, include cable connections, satellites, and fiber optic. They are offered by telephone companies, cable television companies, and satellite service providers. It can be noted that satellite Internet access is the most expensive, dialup is the cheapest. Table A-1 shows a brief comparison of these technologies.

TABLE A-1
Comparing Internet access options

FEATURE	DSL INTERNET	CABLE INTERNET	SATELLITE INTERNET	FIBER OPTIC (FIOS)
Max. High Speed	Up to 1.5 Mbps	Up to 3 Mbps	Up to 1 Mbps	Up to 20 Mbps
Access is through	Existing phone line	Existing TV cable	Satellite dish	Fiber optic phone lines
Availability	Generally available in populated areas	Might not be available in rural areas	Available in all areas; note that satellite service is sensitive to weather conditions	Might not be available in all areas as fiber optic lines are just being installed in many areas

Software

A **program** is a set of instructions to the computer. **Software** is the collection of programs and other data input that tells the computer how to operate its devices, how to manipulate, store, and output information, and how to accept the input you give it. Software fits into two basic categories: systems software and applications software. A third category, network software, is really a type of application.

Systems Software

Systems software refers to the operating system (OS) of the computer. The OS is a group of programs that is automatically copied in from the time the computer is turned on until the computer is turned off. Operating systems serve two functions: they control data flow among computer parts, and they provide the platform on which application and network software work—in effect, they allow the “space” for software and translate its commands to the computer. The most popular operating systems in use today are the Macintosh operating system, MAC OS X and several different versions of Microsoft Windows, such as Windows 2000, Windows XP, or Windows Vista. See Figure A-12 and Figure A-13.

FIGURE A-12
The Windows Vista operating system

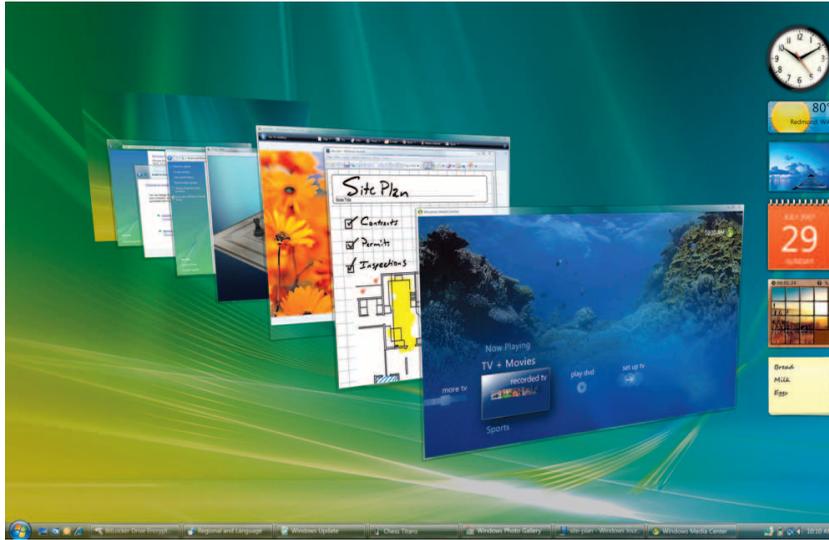


FIGURE A-13
The Mac OS X operating system



Since its introduction in the mid-1970s, Macintosh has used its own operating system, a graphical user interface (GUI) system that has evolved over the years. The OS is designed so users “click” with a mouse on pictures, called icons, or on text to give commands to the system. Data is available to you in the WYSIWYG (what-you-see-is-what-you-get) format; that is, you can see on-screen what a document will look like when it is printed. Graphics and other kinds of data, such as spreadsheets, can be placed into text documents. However, GUIs take a great deal of RAM to keep all of the graphics and programs operating.

The original OS for IBM and IBM-compatible computers (machines made by other companies that operate similarly) was DOS (disk operating system). It did not have a graphical interface. The GUI system, Windows™, was developed to make using the IBM/IBM-compatible computer more “friendly.” Today’s Windows applications are the logical evolution of GUI for

IBM and IBM-compatible machines. Windows is a point-and-click system that automatically configures hardware to work together. You should note, however, that with all of its abilities comes the need for more RAM, or a system running Windows will operate slowly.

Applications Software

When you use a computer program to perform a data manipulation or processing task, you are using applications software. Word processors, databases, spreadsheets, graphics programs, desktop publishers, fax systems, and Internet browsers are all applications software.

Network Software

Novell™ and Windows NT are two kinds of network software. A traditional network is a group of computers that are hardwired (connected together with cables) to communicate and operate together. Today, some computer networks use RF (radio frequency) wireless technology to communicate with each other. This is called a **wireless network**, because you do not need to physically hook the network together with cables. In a typical network, one computer acts as the server, which controls the flow of data among the other computers, called nodes, or clients on the network. Network software manages this flow of information.

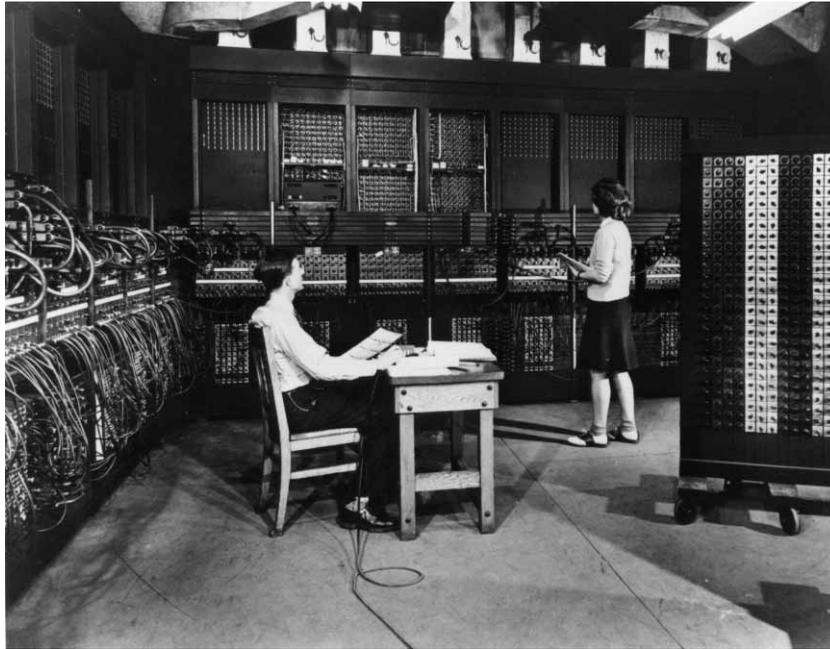
History of the Computer

Though various types of calculating machines were developed in the nineteenth century, the history of the modern computer begins about the middle of the last century. The strides made in developing today's personal computer have been truly astounding.

Early Development

The ENIAC, or Electronic Numerical Integrator and Computer, (see Figure A-14) was designed for military use in calculating ballistic trajectories and was the first electronic, digital computer to be developed in the United States. For its day, 1946, it was quite a marvel because it was able to accomplish a task in 20 seconds that normally would take a human three days to complete. However, it was an enormous machine that weighed more than 20 tons and contained thousands of vacuum tubes, which often failed. The tasks that it could accomplish were limited, as well.

FIGURE A-14
The ENIAC



From this awkward beginning, however, the seeds of an information revolution grew. Significant dates in the history of computer development are listed in Table A-2.

TABLE A-2
Milestones in the development of computers

YEAR	DEVELOPMENT
1948	First electronically stored program
1951	First junction transistor
1953	Replacement of tubes with magnetic cores
1957	First high-level computer language
1961	First integrated circuit
1965	First minicomputer
1971	Invention of the microprocessor (the silicon chip) and floppy disk
1974	First personal computer (made possible by the microprocessor)

The invention of the silicon chip in 1971 and the release of the first personal computer in 1974 launched the fast-paced information revolution in which we now all live and participate.

The Personal Computer

The PC, or personal computer, was mass marketed by Apple beginning in 1977, and by IBM in 1981. It is this desktop device with which people are so familiar and which, today, contains much more power and ability than did the original computer that took up an entire room. The PC is a small computer (desktop size or less) that uses a microprocessor to manipulate data. PCs may stand alone, be linked together in a network, or be attached to a large mainframe computer. See Figure A-15.

FIGURE A-15
Early IBM PC



Computer Utilities and System Maintenance

Computer operating systems let you run certain utilities and perform system maintenance to keep your computer running well. When you add hardware or software, you make changes in the way the system operates. With Plug and Play, most configuration changes are done automatically. The **drivers**, software that runs the peripherals, are installed automatically when your computer identifies the new hardware. When you install new software, many changes are made to the system automatically that determine how the software starts and runs.

In addition, you might want to customize the way the new software or hardware works with your system. You use **utility software** to make changes to the way hardware and software works. For example, you can change the speed at which your mouse clicks, how quickly or slowly keys repeat on the keyboard, and the resolution of the screen display.

Virus and Spyware Protection

Certain maintenance should be performed regularly on computers. **Viruses** are software programs that can damage the programs on your computer causing the computer to either stop working or run slowly. These programs are created by people, called **hackers**, who send the programs out solely to do harm to computers. Viruses are loaded onto your computer without your knowledge and run against your wishes. **Spyware** is also a form of a program that can harm your computer. There are utilities and programs that protect your computer from spyware and viruses.

You should install and update your antivirus and spyware protection software regularly, and scan all new disks and any incoming information from online sources for viruses. Some systems do this automatically; others require you to install software to do it.

Disk Maintenance

From time to time, you should run a program that scans or checks the hard drive to see that there are not bad sectors (areas) and look for corrupted files. Optimizing or defragmenting the hard disk is another way to keep your computer running at its best. Scanning and checking programs often offers the option of “fixing” the bad areas or problems, although you should be aware that this could result in data loss.

Society and Computers

The electronic information era has had global effects and influenced global change in all areas of people’s lives. With the changes of this era have come many new questions and responsibilities. There are issues of ethics, security, and privacy.

Ethics

When you access information—whether online, in the workplace, or via purchased software—you have a responsibility to respect the rights of the person or people who created that information. Digital information, text, images, and sound is very easy to copy and share, however, that does not make it right to do so. You have to treat electronic information with respect. Often images, text, and sound are copyrighted. **Copyright** is the legal method for protecting the intellectual property of the author—the same way as you would a book, article or painting. For instance, you must give credit when you copy information from the Web or another person’s document.

If you come across another person's personal information, you must treat it with respect. Do not share personal information unless you have that person's permission. For example, if you happen to pass a computer where a person left personal banking information software open on the computer, or a personal calendar available, you should not share that information. If e-mail comes to you erroneously, you should delete it before reading it.

When you use equipment that belongs to your school, a company for which you work, or others, here are some rules you should follow:

1. Do not damage computer hardware.
2. Do not add or remove equipment without permission.
3. Do not use an access code or equipment without permission.
4. Do not read others' e-mail.
5. Do not alter data belonging to someone else without permission.
6. Do not use the computer for play during work hours or use it for personal profit.
7. Do not access the Internet for nonbusiness related activities use during work hours.
8. Do not install or uninstall software without permission.
9. Do not make unauthorized copies of data or software or copy company files or procedures for personal use.
10. Do not copy software programs to use at home or at another site in the company without permission.

Security and Privacy

The Internet provides access to business and life-enhancing resources, such as distance learning, remote medical diagnostics, and the ability to work from home more effectively. Businesses, colleges and universities, and governments throughout the world depend on the Internet every day to get work done. Disruptions in the Internet can create havoc and dramatically decrease productivity.

With more and more financial transactions taking place online, **identify theft** is a growing problem, proving a person's online identity relies heavily upon their usernames and passwords. If you do online banking, there are several levels of security that you must pass through, verifying that you are who you claim to be, before gaining access to your accounts. If you divulge your usernames and passwords, someone can easily access your accounts online with devastating effects to your credit rating and to your accounts.

Phishing is a criminal activity that is used by people to fraudulently obtain your personal information, such as usernames, passwords, credit card details, and your social security information. Your social security number should never be given out online. Phishers send e-mails that look legitimate, but in fact are not. Phishing e-mails will often include fake information saying that your account needs your immediate attention because of unusual or suspected fraudulent activity. You are asked to click a link in the e-mail to access a Web site where you are then instructed to enter personal information. See Figure A-16. Phishing e-mail might also come with a promise of winning some money or gifts. When you get mail from people you don't know, the rules to remember are "you never get something for nothing, and if it looks too good to be true, it's most likely not true."

FIGURE A-16a
Fake e-mails for phishing

Message header doesn't include a recipient

A company like PayPal would not use a yahoo.com e-mail address; the sender is NOT PayPal

Most companies won't threaten to cancel you for not updating accounts in an e-mail message

URL you are asked to click is a fake as noted in ScreenTip

FIGURE A-16b
Fake e-mails for phishing

No To: address and From is NOT a ncu.gov address

Never click a link and then type your SSN

Never type or tell your credit/debit card PIN number to anyone

If you type www.ncua.gov in your browser's address bar and then click the link for Fraud/E-mail alert you will see a message warning you about this phishing e-mail

Whatever the ruse, when you click the link provided in the phishing e-mail, your browser will open a Web site that looks real, perhaps like your bank's site, eBay, or PayPal. But, in fact, this is a fake site set up to get you to give up your personal information. Phishing sites are growing. You should never click a link provided in an e-mail to get to sites such as your bank, eBay, or PayPal. Your bank or any other legitimate Web site will never ask you to type personal information on a page linked from an e-mail message. Always type the Web page address directly in the browser. Banks and Web sites have been trying to stop phishing sites through technology. Other attempts to reduce the growing number of reported phishing incidents include legislation and simply educating users about the practice.

Just as you would not open someone else's mail, you must respect the privacy of e-mail sent to others. When interacting with others online, you must keep confidential information confidential. Do not endanger your privacy, safety, or financial security by giving out personal information to someone you do not know.

Career Opportunities

In one way or another, all of our careers involve the computer. Whether you are a grocery store clerk using a scanner to read the prices, a busy executive writing a report that includes charts, graphics, and detailed analysis on a laptop on an airplane, or a programmer writing new software—almost everyone uses computers in their jobs. Most scientific research is done using computers.

There are specific careers available if you want to work with computers in the computer industry. Schools offer degrees in computer programming, computer repair, computer engineering, and software design. The most popular jobs are systems analysts, computer operators, and programmers. Analysts figure out ways to make computers work (or work better) for a particular business or type of business. Computer operators use the programs and devices to conduct business with computers. Programmers write the software for applications or new systems. There are degrees and jobs for people who want to create and maintain Web sites. Working for a company maintaining their Web site can be a very exciting career.

There are courses of study in using CAD (computer-aided design) and CAM (computer-aided manufacturing). There are positions available to instruct others in computer software use within companies and schools. Technical writers and editors must be available to write manuals on using computers and software. Computer-assisted instruction (CAI) is a system of teaching any given subject using the computer. Designing video games is another exciting and ever-growing field of computer work. And these are just a few of the possible career opportunities in an ever-changing work environment. See Figure A-17.

Did you know



Ebay is an online auction Web site that provides people a way to buy and sell merchandise through the Internet. PayPal is a financial services Web site that provides a way to transfer funds between people who perform financial transactions on the Internet.

FIGURE A-17
Working in the computer field



What Does the Future Hold?

The possibilities for computer development and application are endless. Things that were dreams or science fiction only 10 or 20 years ago are now reality. New technologies are emerging constantly. Some new technologies are replacing old ways of doing things; others are merging with those older methods and devices. Some new technologies are creating new markets. The Internet (more specifically, the Web), cell phones, and DVD videos are just a few inventions of the past decades that did not have counterparts prior to their inventions. We are learning new ways to work and play because of the computer. It is definitely a device that has become part of our offices, our homes, and our lives.

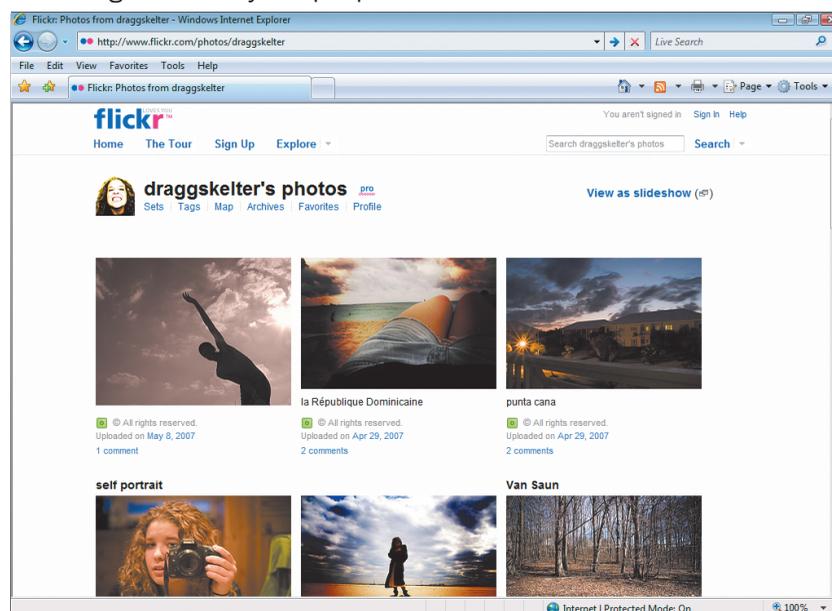
Social networking has moved from the streets and onto the Web. People meet and greet through the Internet using sites such as myspace.com and facebook.com.

Emerging Technologies

Today the various technologies and systems are coming together to operate more efficiently. Convergence is the merging of these technologies. Telephone communication is being combined with computer e-mail and Web browsing so users can set a time to meet online and, with the addition of voice technology, actually speak to each other using one small portable device.

The Web, now an important part of commerce and education, began as a one-way vehicle where users visited the Web to view Web pages and get information. It has evolved into sites where shopping and commerce takes place and is now evolving into a technology where users create the content. Web 2.0 and sites such as facebook.com, flickr.com, wikipedia.com, and youtube.com have content generated by the people that visit the Web sites. See Figure A-18.

FIGURE A-18
Content generated by the people that visit Web sites



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Computers have radically changed the way the medical profession delivers health care. Through the medical community, computers have enhanced medicine and healthcare throughout the world.

Trends

There are many trends that drive the computer industry. One trend is for larger and faster storage. From megabytes, to gigabytes, to terabytes, storage is becoming less an issue as the cost of storage is also dropping. RAM today is increasing exponentially. The trend is to sell larger blocks of RAM with every new personal computer. Newer processors also operate at speeds that are faster than the previous generation processors.

The actual size of computers is decreasing. Technology is allowing more powerful components to fit into smaller devices—laptops are lighter, monitors take up less space on the desktop, and flash drives can fit in your pocket and store gigabytes of data.

Home Offices

More and more frequently, people are working out of their homes—whether they are employees who are linked to a place of business or individuals running their own businesses. **Telecommuting** meets the needs of many industries. Many companies allow workers to have a computer at home that is linked by network to the office. Employees can use laptop computers to work both at home and on the road as they travel. A laptop computer, in combination with a wireless network, allows an employee to work from virtually anywhere and still keep in constant contact with her or his employer and customers.

Business communication is primarily by e-mail and telephone. It is very common for serious business transactions and communications to occur via e-mail rather than through the regular mail. Such an arrangement saves companies workspace and, thus, money.

Home Use

More and more households have personal computers. The statistics are constantly proving that a computer is an essential household appliance. Computers are used to access the Internet for shopping, education, and leisure. Computers are used to maintain financial records, manage household accounts, and record and manage personal information. More and more people are using electronic banking. Games and other computer interactions also offer a more reasonable way of spending leisure dollars. The convergence of television, the Internet, and the computer will find more households using their computers for media such as movies and music.

The future is with computing. It's clear that this technology will continue to expand and provide us with new and exciting trends.