THE HOW OF COMPUTERS

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

Data and Information

Computers process data into information. Data is a collection of unprocessed items, which can include text, numbers, images, audio, and video. Information conveys meaning and is useful to people. Many daily activities either involve the use of or depend on information from a computer. Computers process several data items to print information in the form of a cash register receipt.

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

Information Processing Cycle

Computers process data (input) into information (output). Computers carry out processes 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. A computer often holds data, information, and instructions in storage for future use. Some people refer to the series of input, process, output, and storage activities as the information processing cycle.

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

The Components of a Computer

A computer contains many electric, electronic, and mechanical components known as hardware. These components include input devices, output devices, a system unit, storage devices, and communications devices.

Input Devices

An input device is any hardware component that allows you to enter data and instructions into a computer. Five widely used input devices are the keyboard, mouse, microphone, scanner, and Web cam.

A computer keyboard contains keys you press to enter data into the computer. For security purposes, some keyboards include a fingerprint reader, which allows you to work with the computer only if your fingerprint is recognized. A mouse is a small handheld device. With the mouse, you control movement of a small symbol on the screen, called the pointer, and you make selections from the screen.

A microphone allows you to speak into the computer. A scanner converts printed material (such as text and pictures) into a form the computer can use. A Web cam is a digital video camera that allows you to create movies or take pictures and store them on the computer instead of on tape or film.

Output Devices

An output device is any hardware component that conveys information to one or more people. Three commonly used output devices are a printer, a monitor, and speakers. A printer produces text and graphics on a physical medium such as paper. A monitor displays text, graphics, and videos on a screen. Speakers allow you to hear music, voice, and other audio (sounds).

System Unit

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

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

Storage Devices

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

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

A USB flash drive is a portable storage device that is small and lightweight enough to be transported on a keychain or in a pocket. The average USB flash drive can hold about 4 billion characters. You plug a USB flash drive in a special, easily accessible opening on the computer.

A hard disk provides much greater storage capacity than a USB flash drive. The average hard disk can hold more than 320 billion characters. Hard disks are enclosed in an airtight, sealed case. Although some are portable, most are housed inside the system unit. Portable hard disks are either external or removable. An external hard disk is a separate, freestanding unit, whereas you insert and remove a removable hard disk from the computer or a device connected to the computer.

Hard Disk

An optical disc is a flat, round, portable metal disc with a plastic coating. CDs, DVDs, and Blu-ray Discs are three types of optical discs. A CD can hold from 650 million to 1 billion characters. Some DVDs can store two full-length movies or 17 billion characters. Blu-ray Discs can store about 46 hours of standard video, or 100 billion characters.

Some mobile devices, such as digital cameras, use memory cards as the storage media. You can use a card reader/writer to transfer the stored items, such as digital photos, from the memory card to a computer or printer.

Communications Devices

A communications device is a hardware component that enables a computer to send (transmit) and receive data, instructions, and information to and from one or more computers or mobile devices. A widely used communications device is a modem (Figure 1-3). Communications occur over cables, telephone lines, cellular radio networks, satellites, and other transmission media. Some transmission media, such as satellites and cellular radio networks, are wireless, which means they have no physical lines or wires.

COMPUTER SOFTWARE

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. 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. Software today often has a graphical user interface. With a graphical user interface (GUI pronounced gooey), you interact with the software using text, graphics,

and visual images such as icons. An icon is a miniature image that represents a program, an instruction, or some other object. You can use the mouse to select icons that perform operations such as starting a program. The two categories of software are *system software* and *application software*.

System Software

System software consists of the programs that control or maintain the operations of the computer and its devices. System software serves as the interface between the user, the application software, and the computer's hardware. Two types of system software are

     i.   the operating system, and
     ii.   utility programs.

i.   **Operating System:** An operating system is a set of programs that coordinates all the activities among computer hardware devices. It provides a means for users to communicate with the computer and other software. Many of today's computers use Microsoft's Windows, or Mac OS, Apple's operating system. When a user starts a computer, portions of the operating system are copied into memory from the computer's hard disk. These parts of the operating system remain in memory while the computer is on.

ii. **Utility Program:** A utility program allows a user to perform maintenance-type tasks usually related to managing a computer, its devices, or its programs. For example, you can use a utility program to transfer digital photos to an optical disc. Most operating systems include several utility programs for managing disk drives, printers, and other devices and media. You also can buy utility programs that allow you to perform additional computer management functions.

Application Software

Application software consists of programs designed to make users more productive and/ or assist them with personal tasks. A widely used type of application software related to communications is a Web browser, which allows users with an Internet connection to access and view Web pages or access programs. Other popular application software includes word processing software, spreadsheet software, database software, and presentation software.

Many other types of application software exist that enable users to perform a variety of tasks. These include personal information management, note taking, project management, accounting, document management, computer aided design, desktop publishing, paint/image editing, photo editing, audio and video editing, multimedia authoring, Web page authoring, personal finance, legal, tax preparation, home design/landscaping, travel and mapping, education, reference, and entertainment (e.g., games or simulations, etc.). Software is available at stores that sell computer products and also online at many Web sites.

Installing and Running Programs

When purchasing software from a retailer, you typically receive a box that includes an optical disc(s) that contains the program. If you acquire software from a Web site on the Internet, you may be able to download the program; that is, the program transfers from the Web site to the hard disk in your computer. The instructions in software are placed on storage media, either locally or online. To use

software that is stored locally, such as on a hard disk or optical disc, you usually need to install the software. Web applications that are stored online, by contrast, usually do not need to be installed. Installing is the process of setting up software to work with the computer, printer, and other hardware. When you buy a computer, it usually has some software preinstalled on its hard disk. This enables you to use the computer the first time you turn it on. To begin installing additional software from an optical disc, insert the program disc in an optical disc drive and follow the instructions to begin installation. To install downloaded software, the Web site typically provides instructions for how to install the program on your hard disk.

Once installed, you can run the program. When you instruct the computer to run an installed program, the computer loads it, which means the program is copied from storage (hard disk) to memory (RAM). Once in memory, the computer can carry out, or execute, the instructions in the program so that you can use the program.

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

Programmers use a programming language or program development tool to create computer programs. Popular programming languages include C++, Java, JavaScript, Visual C#, and Visual Basic.