LOVELY PROFESSIONAL UNIVERSITY

INFORMATION AND COMMUNICATION TECHNOLOGY APPLICATIONS

Edited By
Seema Sharma

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SYLLABUS

Information and Communication Technology Applications

Objectives:

- To provide the provision of information services using information communications technologies as a means of increasing awareness.
- To increase the availability of information, guidance and training through information communications technologies - e.g. via the internet
- To increase the use of electronic services.

Sr. No	Topics
1	Introduction to computers: Salient features of computers.
2	Generations of computers
3	Types of computers: Supercomputers, mainframes, personal computers, note book computers.
4	Computer Hardware: Input & Output devices.
5	Software: System software and application software (Basics Only).
6	Windows Operating Systems: Definition and functions. (Basic features). Algorithms and flowcharts.
7	Programming language: Types and functions. Word-Processing software: MS-Word: Creating , editing, and formatting a document.
8	Library Automation: Need and purpose. Application of ICT in different areas in libraries.
9	Online information services , Information Retrieval: search engines Boolean operators
10	Library softwares: Essential features, Study of features of select library packages: WINISIS, LIBSYS, SOUL, KOHA.

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Unit 1: Introduction to Computers

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Objectives

Introduction

1.1 Definition of Computer

1.2 Hardware

1.3 Summary

1.4 Keywords

1.5 Review Questions

1.6 Further Readings

Objectives

After studying this unit, you will be able to:

- Understand the concepts of computer
- Know about the computer hardware

Introduction

Computer Science is the study of computers that includes their evolution, architecture, operation and applications. It combines both theoretical and practical aspects of engineering, electronics and information technology. Information Technology (IT) is the most fascinating technology used by people to handle information. Information technology refers to modern technology based on electronics and computing. Now, computers have become essential tools of Information Technology. Information Technology incorporates the technologies of electronics, computing, networking and telecommunications.

Computers are the essential ingredients for the success of today's man. Computers are being used in almost every field now and everyday new areas of activities are being discovered. There is hardly any area in our society, where computers are not being used. For instance, computers are used in homes, offices, schools, colleges, libraries, universities, nursing homes, hospitals, export houses, shops and business establishments, industries, banks, railway stations, airports, research centers and many other organisations. As, computers are performing most of the routine activities in today's society, it has become essential for everybody to learn computer science. The computer science and information technology have witnessed a tremendous interest among people recently with the introduction of Internet, E-commerce, Mobile commerce, Artificial Intelligence and Virtual Reality.

Notes

We are living in an information age dependent upon digital information. Digital information is electronic information, the result of computer processing. Every type of job relies upon getting information, using it, managing it, and relaying information to others. Computers enable the efficient processing and storage of information.

Do not think of a computer merely as the machine with the keyboard and the mouse, although that might be true for some types of computers. Embedded computers may be inside your household appliances, the VCR, the automobile, planes, trains, power plants, water purification plants, calculators, and even inside a few toys. These embedded computers are very small. They affect our lives each day. Why, even modern traffic lights operate with computers. They are all around us. Think of additional ways in which computers affect our lives each day.

Technically, a computer is a programmable machine. This means it can execute a programmed list of instructions and respond to new instructions that it is given. Today, however, the term is most often used to refer to the desktop and laptop computers that most people use. When referring to a desktop model, the term "computer" technically only refers to the computer itself — not the monitor, keyboard, and mouse. Still, it is acceptable to refer to everything together as the computer. If you want to be really technical, the box that holds the computer is called the "system unit."

Some of the major parts of a personal computer (or PC) include the motherboard, CPU, memory (or RAM), hard drive, and video card. While personal computers are by far the most common type of computers today, there are several other types of computers. For example, a "minicomputer" is a powerful computer that can support many users at once. A "mainframe" is a large, high-powered computer that can perform billions of calculations from multiple sources at one time. Finally, a "supercomputer" is a machine that can process billions of instructions a second and is used to calculate extremely complex calculations.

1.1 Definition of Computer

In a layman's language, a computer is a fast calculating device that can perform arithmetic operations. Although the computer was originally invented mainly for doing high speed and accurate calculations, it is not just a calculating device. Computer can perform any kind of work involving arithmetic and logical operations on data. It gets the data through an input device, processes it as per the instructions given and gives the information as output.

A computer is defined as a fast electronic device that processes the input data according to the instructions given by the programmer/user and provides the desired information as output.

The terms used in the above definition are defined in Table 1.1.

Table 1.1: Terms Used While Defining a computer

Term	Definition
Data	A set of basic facts and entities which itself has no meaning
Information	Data which has some meaning or value
Instruction	A statement given to computer to perform a task
Input	Data and instructions given to computer
Process	Manipulation of data
Output	Information obtained after processing of data

1.2 Hardware

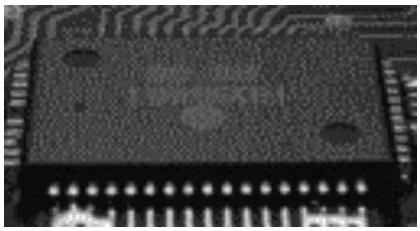
Notes

The hardware are the parts of the computer itself including the Central Processing Unit (CPU) and related microchips and micro-circuitry, keyboards,monitors, case and drives (hard, CD, DVD, floppy, optical, tape, etc...). Other extra parts called peripheral components or devices include mouse, printers, modems, scanners, digital cameras and cards (sound, colour, video) etc... Together they are often referred to as a personal computer.

Central Processing Unit-Though the term relates to a specific chip or the processor a CPU's performance is determined by the rest of the computer's circuitry and chips.

Currently the Pentium chip or processor, made by Intel, is the most common CPU though there are many other companies that produce processors for personal computers. Examples are the CPU made by Motorola and AMD.

Figure 1.1



With faster processors the clock speed becomes more important. Compared to some of the first computers which operated at below 30 megahertz (MHz) the Pentium chips began at 75 MHz in the late 1990's. Speeds now exceed 3000+ MHz or 3 gigahertz (GHz) and different chip manufacturers use different measuring standards (check your local computer store for the latest speed). It depends on the circuit board that the chip is housed in, or the motherboard, as to whether you are able to upgrade to a faster chip. The motherboard contains the circuitry and connections that allow the various component to communicate with each other.

Though there were many computers using many different processors previous to this I call the 80286 processor the advent of home computers as these were the processors that made computers available for the average person. Using a processor before the 286 involved learning a proprietary system and software. Most new software are being developed for the newest and fastest processors so it can be difficult to use an older computer system.

***Keyboard*:** The keyboard is used to type information into the computer or input information. There are many different keyboard layouts and sizes with the most common for Latin based languages being the QWERTY layout (named for the first 6 keys). The standard keyboard has 101 keys. Notebooks have embedded keys accessible by special keys or by pressing key combinations (CTRL or Command and P for example). Ergonomically designed keyboards are designed to make typing easier. Hand held devices have various and different keyboard configurations and touch screens.

Some of the keys have a special use. They are referred to as command keys. The 3 most common are the Control (CTRL), Alternate (Alt) and the Shift keys though there can be more (the Windows key for example or the Command key). Each key on a standard keyboard has one or two characters. Press the key to get the lower character and hold Shift to get the upper.

***Removable Storage and/or Disk Drives*:** All disks need a drive to get information off-or read-and put information on the disk-or write. Each drive is designed for a specific type of disk whether it is a CD, DVD, hard disk or floppy. Often the term 'disk' and 'drive' are used to describe the same thing but it helps to understand that the disk is the storage device which contains computer files-or software-and the drive is the mechanism that runs the disk.

Notes

Figure 1.2

Did u know? Digital flash drives work slightly differently as they use memory cards to store information so there are no moving parts. Digital cameras also use Flash memory cards to store information, in this case photographs. Hand held devices use digital drives and many also use removable or built in memory cards.

Mouse: Most modern computers today are run using a mouse controlled pointer. Generally if the mouse has two buttons the left one is used to select objects and text and the right one is used to access menus. If the mouse has one button (Mac for instance) it controls all the activity and a mouse with a third button can be used by specific software programs.

One type of mouse has a round ball under the bottom of the mouse that rolls and turns two wheels which control the direction of the pointer on the screen. Another type of mouse uses an optical system to track the movement of the mouse. Laptop computers use touch pads, buttons and other devices to control the pointer. Hand helds use a combination of devices to control the pointer, including touch screens.

Notes It is important to clean the mouse periodically, particularly if it becomes sluggish. A ball type mouse has a small circular panel that can be opened, allowing you to remove the ball. Lint can be removed carefully with a tooth pick or tweezers and the ball can be washed with mild detergent. A build up will accumulate on the small wheels in the mouse. Use a small instrument or finger nail to scrape it off taking care not to scratch the wheels. Track balls can be cleaned much like a mouse and touch-pad can be wiped with a clean, damp cloth. An optical mouse can accumulate material from the surface that it is in contact with which can be removed with a finger nail or small instrument.

Monitors: The monitor shows information on the screen when you type. This is called outputting information. When the computer needs more information it will display a message on the screen, usually through a dialog box. Monitors come in many types and sizes. The resolution of the monitor determines the sharpness of the screen. The resolution can be adjusted to control the screen's display..

Most desktop computers use a monitor with a cathode tube or liquid crystal display. Most notebooks use a liquid crystal display monitor.

To get the full benefit of today's software with full colour graphics and animation, computers need a color monitor with a display or graphics card.

Notes

Printers: The printer takes the information on your screen and transfers it to paper or a hard copy. There are many different types of printers with various levels of quality. The three basic types of printer are; dot matrix, inkjet, and laser.

- Dot matrix printers work like a typewriter transferring ink from a ribbon to paper with a series or 'matrix' of tiny pins.
- Ink jet printers work like dot matrix printers but fires a stream of ink from a cartridge directly onto the paper.
- Laser printers use the same technology as a photocopier using heat to transfer toner onto paper.

Task What do you mean by printer? Explain the different types of printers.

Modem: A modem is used to translate information transferred through telephone lines, cable, satellite or line-of-sight wireless.

The term stands for modulate and demodulate which changes the signal from digital, which computers use, to analog, which telephones use and then back again. Digital modems transfer digital information directly without changing to analog.

Modems are measured by the speed that the information is transferred. The measuring tool is called the baud rate. Originally modems worked at speeds below 2400 baud but today analog speeds of 56,000 are standard. Cable, wireless or digital subscriber lines can transfer information much faster with rates of 300,000 baud and up.

Modems also use Error Correction which corrects for transmission errors by constantly checking whether the information was received properly or not and Compression which allows for faster data transfer rates. Information is transferred in packets. Each packet is checked for errors and is re-sent if there is an error.

Anyone who has used the Internet has noticed that at times the information travels at different speeds. Depending on the amount of information that is being transferred, the information will arrive at it's destination at different times. The amount of information that can travel through a line is limited. This limit is called bandwidth.

There are many more variables involved in communication technology using computers, much of which is covered in the section on the Internet.

Scanners: Scanners allow you to transfer pictures and photographs to your computer. A scanner 'scans' the image from the top to the bottom, one line at a time and transfers it to the computer as a series of bits or a bitmap. You can then take that image and use it in a paint program, send it out as a fax or print it. With optional Optical Character Recognition (OCR) software you can convert printed documents such as newspaper articles to text that can be used in your word processor. Most scanners use TWAIN software that makes the scanner accessable by other software applications.

Digital cameras allow you to take digital photographs. The images are stored on a memory chip or disk that can be transferred to your computer. Some cameras can also capture sound and video.

CASE: The case houses the microchips and circuitry that run the computer. Desktop models usually sit under the monitor and tower models beside. They come in many sizes, including desktop, mini, midi, and full tower. There is usually room inside to expand or add components at a later time. By removing the cover off the case you may find plate covered, empty slots that allow you to add cards. There are various types of slots including IDE, ASI, USB, PCI and Firewire slots.

Depending on the type notebook computers may have room to expand . Most Notebooks also have connections or ports that allows expansion or connection to exterior, peripheral devices such as monitor, portable hard-drives or other devices.

Notes

Cards: Cards are components added to computers to increase their capability. When adding a peripheral device make sure that your computer has a slot of the type needed by the device.

Sound cards allow computers to produce sound like music and voice. The older sound cards were 8 bit then 16 bit then 32 bit. Though the human ear can't distinguish the fine difference between sounds produced by the more powerful sound card they allow for more complex music and music production.

Colour cards allow computers to produce colour (with a colour monitor of course). The first colour cards were 2 bit which produced 4 colours [CGA]. It was amazing what could be done with those 4 colours. Next came 4 bit allowing for 16 [EGA and VGA] colours. Then came 16 bit allowing for 1064 colours and then 24 bit which allows for almost 17 million colours and now 32 bit and higher allow monitors to display almost a billion separate colours.

Video cards allow computers to display video and animation. Some video cards allow computers to display television as well as *capture* frames from video. A video card with a digital video camera allows computers users to produce live video. A high speed connection is required for effective video transmission.

Network cards allow computers to connect together to communicate with each other. Network cards have connections for cable, thin wire or wireless networks. For more information see the section on Networks.

Cables connect internal components to the **Motherboard**, which is a board with series of electronic path ways and connections allowing the CPU to communicate with the other components of the computer.

Memory: Memory can be very confusing but is usually one of the easiest pieces of hardware to add to your computer. It is common to confuse chip memory with disk. An example of the difference between memory and storage would be the difference between a table where the actual work is done (memory) and a filing cabinet where the finished product is stored (disk). To add a bit more confusion, the computer's hard disk can be used as temporary memory when the program needs more than the chips can provide.

Random Access Memory or **RAM** is the memory that the computer uses to temporarily store the information as it is being processed. The more information being processed the more RAM the computer needs.

One of the first home computers used 64 **kilobytes** of RAM memory (Commodore 64). Today's modern computers need a minimum of 64 Mb (recommended 128 Mb or more) to run Windows or OS 10 with modern software.

RAM memory chips come in many different sizes and speeds and can usually be expanded. Older computers came with 512 Kb of memory which could be expanded to a maximum of 640 Kb. In most modern computers the memory can be expanded by adding or replacing the memory chips depending on the processor you have and the type of memory your computer uses. Memory chips range in size from 1 Mb to 4 Gb. As computer technology changes the type of memory changes as well making old memory chips obsolete. Check your computer manual to find out what kind of memory your computer uses before purchasing new memory chips.

Self Assessment

Fill in the blanks:

1. Digital information is ..... information.
2. RAM stands for ..... .
3. ..... allow computers to display video and animation.
4. ..... allow computers to connect together to communicate with each other.

Notes

1.3 Summary

- Technically, a computer is a programmable machine. This means it can execute a programmed list of instructions and respond to new instructions that it is given.
- Some of the major parts of a personal computer (or PC) include the motherboard, CPU, memory (or RAM), hard drive, and video card.
- Most desktop computers use a monitor with a cathode tube or liquid crystal display. Most notebooks use a liquid crystal display monitor.
- Modems are measured by the speed that the information is transferred. The measuring tool is called the baud rate. Originally modems worked at speeds below 2400 baud but today analog speeds of 56,000 are standard.

1.4 Keywords

Digital Camera: Digital camera allow you to take digital photograph.

Sound Cards: Sound cards allow computers to produce sound like music and voice.

Network Cards: Network cards allow computers to connect together to communicate with each other.

1.5 Review Questions

1. Write short notes on RAM.
2. What is modem?
3. What do you mean by memory? Explain.
4. Discuss about the disk drives.

Answers: Self Assessment

1. electronic
2. random access memory
3. video cards
4. network cards

1.6 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
2. Ravichandra Rao, (IK): *Library automation.* New Delhi: Wiley Eastern.
3. Rowley, (J.) *The electronic library.* 4th ed. London: LA, 1998.
4. Satyanarayana, (NR): *A manual of computerisation in libraries.*

Online link

http://www.irmt.org

http://web.uettaxila.edu.pk

http://www.businessdictionary.com

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Unit 2: Generation of Computers

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2.1.2 Zeroth Generation Computers (1642–1946)

2.1.3 First Generation Computers (1946–1954)

2.1.4 Second Generation Computers (1953–1964)

2.1.5 Third Generation Computers (1964–1980)

2.1.6 Fourth Generation Computers (1978–Till Date)

2.1.7 Fifth Generation Computers

2.2 Summary

2.3 Keywords

2.4 Review Questions

2.5 Further Readings

Objectives

After studying this unit, you will be able to:

- Know about the history of computers
- Describe the earlier computing devices
- Discuss about the fifth generation computers

Introduction

A generation refers to the state of inprovement in the development of a product. This term is also used in the different advancements of computer technology. With each new generation, the circuitry has gotten smaller and more advanced than the previous generation before it. As a result of the miniaturization, speed, power, and memory of computers has proportionally increased. New discoveries are constantly being developed that affect the way we live, work and play.

2.1 History of Computers

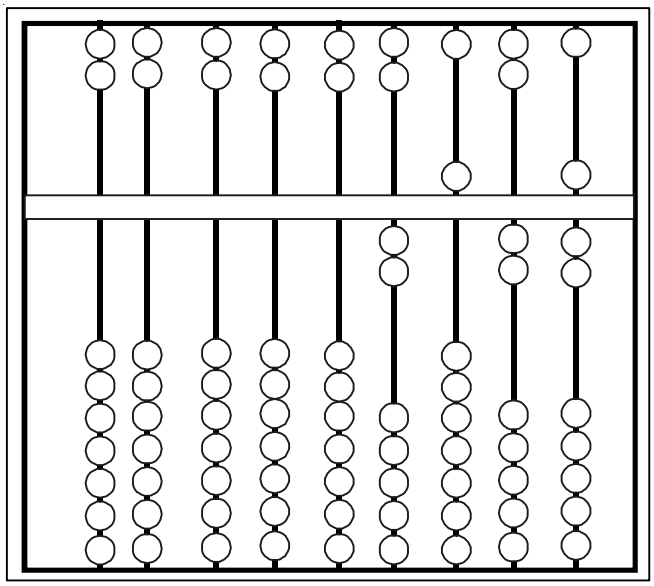
Notes

History of computers begins with the invention of the abacus in 3000 BC, followed by the invention of mechanical calculators in 1617. The years beyond 1642 till 1980 are marked by inventions of zeroth, first, second and third generation computers. The years beyond 1980 till today, are marked by fourth generation computers. Fifth generation computers are still under research and development.

2.1.1 Earlier Computing Devices (3000 BC–1617 AD)

Abacus is a rudimentary first computing device developed in 3000 BC. It consists of a row of wires held in a wooden frame having beads stung on them as shown in Figure 2.1. It is used for calculations by sliding the heads along the wires.

Figure 2.1: The Abacus—First Computing Device



Did u know? In 1617, John Napier, a Scottish mathematician invented a mechanical calculator called the 'Napier's bones'. He devised a set of eleven rods each having four faces. As these rods were carved from bones, therefore they were called *Napier's bones*. The rods were used to find products and quotients of large numbers. John Napier also introduced logarithms.

2.1.2 Zeroth Generation Computers (1642–1946)

The zeroth generation of computers (1642–1946) was marked by the invention of mainly mechanical computers. *Pascaline* was the first mechanical device, invented by Blaise Pascal, a French mathematician in 1642. In this machine, numbers were entered, by dialing a series of number wheels. A series of toothed wheels transferred the movements to a dial and hence showed the results. In

Notes

1800, *punched card* was invented by Jacquard. It is an obsolete computer input device, mode of stiff paper that stores data in columns containing patter of punched holes.

In 1822, Charles Babbage, an English mathematician, designed a machine called *Difference Engine* to compute tables of numbers for naval navigation. Later on, in the year 1834, Babbage attempted to build a digital computer, called *Analytical Engine*. The analytical engine had all the parts of a modern computer *i.e.* it had four components — the store (memory unit), the mill (computation unit), the punched card reader (input unit) and the punched/ printed output (output unit). As all basic parts of modern computers were thought out by Charles Babbage, he is known as *Father of Computers*. The daughter of the poet Lord Byron, Augusta Ada became Charles Babbage's most enthusiatic supporter. She wrote programs for the Analytical Engine and made several innovations that are central to programming today.

In later years, Herman Hollerith invented a machine for doing counting for 1880 US census, which was called the *Tabulating Machine*. In 1944, Howard A. Eiken invented first American general purpose electro-mechanical computer, called *Mark I* and later on its successor, *Mark II*. The zeroth generation of computers or the era of mechanical computers ended in 1946, when vacuum tubes were invented. Various inventions during era of mechanical computers are described in Table 2.1.

Table 2.1: History of Computers During the Year 1642–1946

Year	Invention
1642	The Arithmetic Machine, invented by Blasic Pascal.
1800	First punched cards for storing data, invented by Jacquard.
1822	The Difference Engine, invented by Charles Babbage.
1834	The Analytical Engine, Invented by Charles Babbage
1857	Sir Charles Wheatstone used paper tape to store data.
1936	Dvorak keyboard, developed by August Dvarak and William L. Dealyed.
1937	Konrad Zuse completed the first fully functioning electro-mechanical computer of the world.

2.1.3 First Generation Computers (1946–1954)

The first generation of computers (1946–1954) was marked by the use of vacuum tubes or valves as their basic electronic component. Although these computers were faster than earlier mechanical devices, they had many disadvantages. First of all, they were very large in size. They consumed too much power and generated too much heat, when used for even short duration of time. They were very unreliable and broke down frequently. They required regular maintenance and their components had also to be assembled manually.

Example:

(*i*) ***ENIAC (Electronic Numerical Integrator and Calculator).*** It was the first electronic computer using vacuum tubes. It was the first stored-program computer, built by John Mauchly and J. Presper Eckert. It took up 1,000 square feet of floor space. Cards, lights, switches, and plugs were the input/output device of this computer as shown in Figure 2.2. The speed of this Computer was 5,000 operations per second.

Notes

Figure 2.2: ENIAC

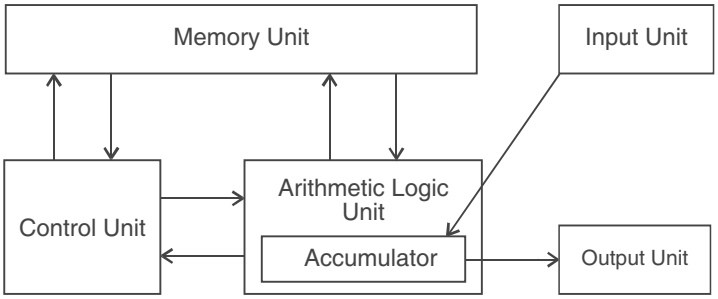
(*ii*) ***EDSAC (Electronic Delay Storage Automatic Calculator).*** It was made by Maurice Wilkes, at Cambrige University. Its speed was 714 operations per second as shown in Figure 2.3.

Figure 2.3: EDSAC

(*iii*) ***EDVAC (Electronic Discrete Variable Automatic Computer).*** It was successor of EDSAC.

(*iv*) ***IAS machine (Princeton's Institute of Advanced Studies).*** It was a new version of the EDVAC, built by von Neumann. The basic design of IAS machine is now known as *von Neumann* machine, which had five basic parts—the memory, the arithmetic logic unit, the program control unit, the input and output unit as shown in Figure 2.4.

Figure 2.4: The Original Von Neumann Machine



Notes

(*v*) ***UNIVAC I (Universal Automatic Calculator).*** It was the first computer to handle both numeric and textual information as shown in Figure 2.5.

Figure 2.5: UNIVAC I

Various historical events happened during 1946 to 1954 are described in Table 2.2.

Table 2.2: History of Computers During the Year 1946–1952

Year	Invention
1946	First electronic general purpose computer: ENIAC
1947	Invention of Williams Tube by modifying a cathode-ray tube to display dots and dashes which represented binary ones and zeros, by Sir Frederick Williams of Manchester University.
1947	Successfully testing of the point-contact transistor, by William Shockley, Walter Brattain, and John Bardeen.
1949	Manchester Mark I computer having 1300 vacuum tubes, invented by Frederick Williams and Tom Kilburn.
1950	SEAC (Standards Eastern Automatic Computer), built by the National Bureau of Standards in Washington to test component and systems.
1951	First stored program computer is EDVAC.
1952	First commercial computer UNIVAC.

2.1.4 Second Generation Computers (1953–1964)

The first generation of computers became out-dated, when in 1954, the Philco Corporation developed transistors that can be used in place of vacuum tubes. The second generation of computers (1953–64) was marked by the use of transistors in place of vacuum tubes. Transistors had a number of advantages over the vacuum tubes. As transistors were made from pieces of silicon, so they were more compact than vacuum tubes. The second-generation computers, therefore, were smaller in size and less heat generated than first generation computers. Although they were slightly faster and more reliable than earlier computers, they also had many disadvantages. They had limited storage capacity, consumed more power and were also relatively slow in performance. Like first generation computers, they also required regular maintenance and their components had also to be

assembled manually. Manual assembly of components was very expensive and later many attempts were made to reduce such manual assembly. It was in 1964, when it was discovered that a number of transistors could be sealed up into a tiny package, called an *Integrated Circuit* (IC) or a *Chip*.

Notes

Example:

1. IBM 701, IBM's first electronic large computer.
2. PDP-1, developed by DEC was the first minicomputer as shown in Figure 2.6.

Figure 2.6: PDP-1

3. IBM 650, The magnetic drum calculator was the first mass-produced computer. Various historical events occurred during 1954–1964 are described in Table 2.3.

Table 2.3: History of Computers During the Year 1954–1964

Year	Invention
1953	IBM 701, IBM's first electronic large computer that could perform 17,000 instructions per second.
1954	Beginning of commercial production of silicon transistor by Texas instrument.
1956	The first transistorised computer. TX-O (Transistorized Experimental computer).
1958	First integrated circuit built by Jack Kilby at Texas Instruments.
1960	First automatic mass-production facility for transistors, developed by IBM.
1962	Patent on the mouse-pointing device for computers, received by Douglas Engelbart.
1964	The BASIC programming language developed by John Kemeny and Thomas Kurtz at Dartmouth College.

2.1.5 Third Generation Computers (1964–1980)

Second generation computers became out-dated after the invention of ICs. The third generation of computers (1964–978) was marked by use of Integrated Circuits (ICs) in place of transistors. As hundreds of transistors could be put on a single small circuit, so ICs were more compact than transistors. An integrated circuit is a microelectronic semiconductor device consisting of many interconnected transistors and other components. ICs are constructed on a small rectangle cut from a Silicon wafer.

Notes

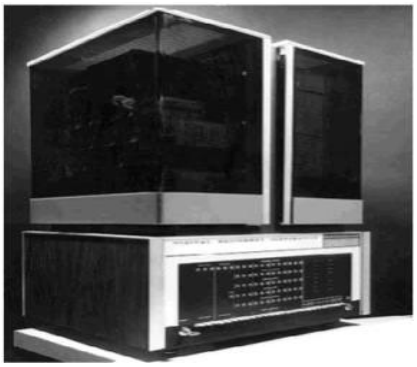
Notes Semiconductor is a material, typically crystalline, which allows current to flow under certain circumstances. Common semiconductors are silicon, germanium, and gallium arsenide. Semiconductors are used to make diodes, transistors and other basic "solid state" electronic components.

The third generation computers, removed many drawbacks of second generation computers. The third generation computers were even smaller in size, very less heat generated and required very less power as compared to earlier two generation of computers. These computers required less human labour at the assembly stage. Although, third generation computers were also still faster and even more reliable, they also had few disadvantages. They still had less storage capacity, relatively slower performance and thus could not fulfill the requirements of the users and programmers.

Example:

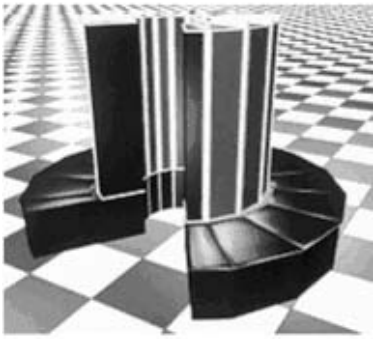
1. IBM 360, developed by IBM in 1964 was the first product line designed as a family.
2. PDP-8, developed by DEC in 1965 was the first mass-market minicomputer as shown in Figure 2.7.

Figure 2.7: PDP-8



3. PDP-11, developed by DEC in 1970 was the first highly successful minicomputer.
4. CRAY-1, developed by Cray in 1976 was the first supercomputer as shown in Figure 2.8.

Figure 2.8: CRAY-1



5. VAX, developed by DEC in 1978 was the first super minicomputer.

Various historical events during 1964–1980 are described in Table 2.4.

Notes

Table 2.4: History of Computers During the Year 1964–1978

Year	Invention
1964	IBM 360 computer, built by IBM.
1967	First floppy disk, built by IBM. Unix, developed at AT&T's Bell Laboratories.
1970	First 4004 microprocessor, created by Intel.
1971	Intel introduced its 4-bit bus, 108-KHz 4004 chip—the first microprocessor. Niklaus Writhe invented the Pascal programming language.
1972	Traf-O-Data Company formed by Bill Gates and Paul Allen. 5.25 inch diskettes first appeared.
1973	Gary Kildall wrote a simple operating system in his PL/M language, called CP/M. IBM introduced the IBM 3340 hard disk unit, known as the Winchester.
1974	2-MHz 8080 chip, an 8-bit microprocessor, released by Intel. The C programming language, developed by Brian Kernighan and Dennis Ritchie.
1975	Gates and Allen's Traf-O-Data Company was renamed Microsoft.
1976	Intel introduced the 5-MHz 8085 microprocessor.

2.1.6 Fourth Generation Computers (1978–Till Date)

The third generation computers became out-dated, when it was found in around 1978 that thousands of ICs could be integrated onto a single chip, called *Large Scale Integration* (LSI). The fourth generation of computers (1978–till date) was marked by use of large-scale Integrated (LSI) circuits in place of ICs. As thousands of ICs could be put onto a single circuit, so LSI circuits are still more compact than ICs. In 1978, it was found that millions of components could be packed onto a single circuit, known as *Very Large Scale Integration* (VLSI). VLSI is the latest technology of computer that led to the development of the popular Personal Computers (PCs), also called as *Microcomputers*. All present day computers are fourth generation of computers. These computers are very powerful having a high memory and a fast processing speed. Today's PCs are even more powerful than mainframe computers.

Example:

1. IBM PC, developed in 1981 was the first industry standard personal computer, having Intel 8088 memory chip.
2. IBM PC/AT, developed in 1982 was the first advanced technology PC, having Intel 80286 memory chip.
3. 386, developed in 1985, had Intel 80386 memory chip.
4. CRAY-2, developed in 1985, was the fourth generation supercomputer.
5. 486, developed in 1989, had Intel 80486 memory chip.
6. Pentium, developed in 1995, has Pentium (80586) memory chip.

Various events occurred during 1975—till date are described in Table 2.5.

Notes

Table 2.5: History of Computers During the Year 1978–till Date

Year	Invention
1978	The 4.77-MHz 8086 microprocessor, introduced by Intel.
1979	The 4.77-MHz 8088 microprocessor, introduced by Intel.
1980	The first Winchester 5.25-inch hard disk drive, introduced by Seagate Technologies. The XENIX OS, a portable and commercial version of Unix, developed by Microsoft. The 8087 math coprocessor, introduced by Intel.
1982	The 6-MHz 80286 microprocessor, introduced by Intel. MS-DOS 1.1, released by Microsoft. Lotus 1-2-3, released by Lotus Development. Microsoft released Microsoft COBOL for MS-DOS. Mouse Systems introduced the first commercial mouse for the IBM PC.
1983	AT&T Bell Labs designed C++. IBM announced the IBM PC-XT Model 370. Microsoft formally announced Microsoft Windows. Novell introduced the NetWare network operating system for the IBM PC.
1984	The PC-AT model of microcomputer, introduced by IBM. Microsoft released MS-DOS 3.0 for PCs. Hewlett-Packard introduced the LaserJet laser printer Philips announced CD ROM players for personal computers
1985	Intel introduced the 16-MHz 80386DX microprocessor. Microsoft introduced Windows 1.0.
1986	Microsoft released MS-DOS 3.2. IBM boosted the speed of the IBM PC AT by replacing the CPU with a 8-MHz Intel 80286.
1987	Intel introduced the 20-MHz 80386DX microprocessor. IBM and Microsoft announced Operating System/2 (OS/2) Windows 2.0, introduced by Microsoft. The 80387 math coprocessor, introduced by Intel.
1988	Intel introduced the 25-MHz 80386DX microprocessor. Microsoft released MS-DOS 4.0. Intel introduced the 16-MHz 80386SX microprocessor. Hewlett-Packard introduced the HP DeskJet inkjet printer
1989	The 80486 microprocessor, introduced by Intel. Microsoft released Word 5.0 for DOS.
1990	Intel introduced the 33-MHz 486 microprocessor. Windows 3.0, introduced by Microsoft.
1991	Microsoft released MS-DOS 5.0.
1992	Windows 3.1, introduced by Microsoft.
1993	Microsoft release MS-DOS 6.0. Pentium, a family of 32-bit microprocessors introduced by Intel.
1994	Pentium pro, successes to the Pentium, introduced by Intel. Windows 95, an operating system with a graphical user interface for 8386 and higher processors, released by Microsoft.
1997	Pentium II, a Pentium pro with MMX instructions introduced by Intel.
1998	Celeron, a low-priced version of the Pentium II for desktop PCS Introduced by Intell. Windows 98, released by Microsoft.
1999	Pentium III with 450/500 MHz clock speed introduced by Intel.
2000	Windows 2000 introduced by Microsoft.
2001	Pentium 4, the latest in Pentium series, introduced by Intel.

Notes

2.1.7 Fifth Generation Computers

Although fourth generation computers offer too many advantages to users, still they have one main disadvantage. The major drawback of these computers is that they have no intelligence on their own. Scientists are now trying to remove this drawback by making computers, which would have artificial intelligence. The fifth generation computers (Tomorrow's computers) are still under research and development stage. These computers would have artificial intelligence. They will use *Ultra Large-Scale Integration* (ULSI) chips in place of VLSI chips. One USLI chip contains millions of components on a single IC. The most important feature of fifth generation computers is that they will use an intelligent software. This software will enable the user to tell computer 'What to do' and not 'How to do' by using intelligent programming and knowledge-based problem solving techniques. So, the programmers or users would not require to give each and every instruction to the computer for solving a problem. These computers will also have user interface in form of speech in natural languages.

Example: Yet to develop, but Robots have some features of fifth generation computers.

The comparative features of various generation of computers are shown in Table 2.6.

Table 2.6: Comparison of Generation of Computers

Criteria	Basic Electronic Component	Speed	Size	Availability
First Gen. Computers	Vacuum Tubes/ Valves	Slowest	Largest	Out-dated
Second Gen. Computers	Transistors	Slower	Large	Out-dated
Third Gen. Computers	ICs (Integrated Circuits)	Medium	Medium	Out-dated
Fourth Gen. Computers	VLSIs (Very Large Scale Integration)	Faster	Smallest	Current
Fifth Gen. Computers	ULSI (Ultra Large Scale Integration)	Fastest	Medium	Under R & D

Self Assessment

Fill in the blanks:

1. First computing device developed in ..... .
2. Who is known the father of computers .....?
3. The arithmetic machine, invented by ..... .
4. When the first commercial computer UNIVAC was invented ..... .

Notes

2.2 Summary

- Fifth generation computers are still under research and development.
- In 1617, John Napier, a Scottish mathematician invented a mechanical calculator called the 'Napier's bones'.
- In later years, Herman Hollerith invented a machine for doing counting for 1880 US census, which was called the *Tabulating Machine*.
- It was in 1964, when it was discovered that a number of transistors could be sealed up into a tiny package, called an *Integrated Circuit* (IC) or a *Chip*.

2.3 Keywords

ENIAC: It was the first electronic computer using vaccum tube.

UNIVACI: It was the first computer to handle both numeric and textual information.

Semiconductor: Semiconductor are used to make diodes, transistors and other basic "solid state" electronic components.

2.4 Review Questions

1. What do you mean by earlier computing devices?
2. Write a note on history of computer.
3. Describe the feature of fourth generation computers.

Answers: Self Assessment

1. 3000 BC
2. Charles Babbage
3. Blasic Pascal
4. 1952

2.5 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
2. Ravichandra Rao, (IK): *Library automation.* New Delhi: Wiley Eastern.
3. Rowley, (J.) *The electronic library.* 4th ed. London: LA, 1998.
4. Satyanarayana, (NR): *A manual of computerisation in libraries.*

Online link

http://www.lsp4you.com

http://www.techiwarehouse.com

Notes

Unit 3: Features of Computers

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3.2 Features-Computers in Libraries 2001

3.3 Useful Tools: Gadgets in Libraries

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Objectives

After studying this unit, you will be able to:

- Discuss about the characteristics of a computer
- Describe the features-computers in libraries 2001
- Know about the useful tools: gadgets in libraries

Introduction

There are many kinds of computers, from the familiar desktop computer to the business or scientific mainframe to the thousands of different, specialized computers such as the ones found today in automobiles and cell phones. All computers have a few operational features in common.

Notes

Input: This is a way to direct or inform the computer. Examples are the keyboard and mouse, removable disks, as well as external instruments or networks.

Processing: The computer has a processing area that can do work. The CPU, or central processing unit, can be designed or instructed to perform any number of different tasks.

Output: There is a way the computer can export results. Examples are video monitors, speakers, removable disks, instruments, or networks.

Most computers also have one or more ways of storing information within.

Memory: One type of memory (RAM: random-access memory) can retain information for the computer's own use while processing data; another kind (ROM: read-only memory) can hold necessary reference information even while the computer is off.

3.1 Characteristics of a Computer

A computer has the following characteristics, which makes it so important for all of us:

1. ***Fast.*** A computer is so fast that it can perform the given task (arithmetical or logical) in few seconds as compared to man who can spend many months for doing the same task. A computer can process millions of instructions per second.

2. ***Accurate.*** While doing calculations, a computer is more accurate than a man. Man can make mistakes in calculations but a computer does not, if it is provided with accurate instructions.

3. ***High Memory.*** A computer has much more memory or storage capacity than human beings. It can store millions of data and instructions, which can be retrieved and recalled even after a number of years. This is not possible in case of human brain.

4. ***Diligence.*** A computer does not suffer from the human traits of tiredness and boredom. Man will be tired and bored while doing millions of calculations but computer, being a machine, does this job very efficiently and without any tiredness and boredom.

3.2 Features-Computers in Libraries 2001

Information Today's 16th Annual Computers in Libraries conference discussed the current uses of technology in libraries and upcoming innovations. The conference succeeded in bringing together speakers from the information industry and the library world. Together they represented both sides of many library-related controversies such as the future of copyright and database protection.

3.3 Useful Tools: Gadgets in Libraries

3.3.1 E-Books

Another theme of the program was how to effectively harness the power of high-tech gadgets. The programs discussed e-books and handheld PDAs in detail. Susan Gibbons of the University of Rochester reported on her study of e-books. She asked library patrons to read a book with an e-book reader. To her surprise she discovered that patrons quickly embraced the books; 67% finished one or more books. None of them complained about eyestrain. 35% preferred e-books over print, and another 23% had no preference between print and e-books. Participants enjoyed the ability to increase the font of the book. They also liked being able to read in the dark with the backlighting. Those who traveled found the e-book easier to carry than most paper books. Other advantages of e-books are the ability to hyperlink to a dictionary and to create bookmarks.

Notes

Did u know? Gibbons suggested several uses for e-books. Those with disabilities might like the ease of use. The e-book's hyperlink ability might help people learn a language by linking a translation to a foreign language work. The voice e-book is a new innovation that will read books aloud. It may help those with learning disabilities because they could listen to the e-book while reading along with a book.

3.3.2 PDAs

During a segment on wireless libraries, Denise Watkins and Nancy Carroll-Klein from Smithkline Beecham Pharmaceuticals discussed PDA's, such as Palms. They commented that the little computers are more than expensive schedulers. The power of PDA's is the ability to easily transport literature. Newer models allow wireless delivery of information. The speakers discussed the possibility that libraries could deliver current awareness news to a patron's PDA. They also listed several information providers that already create content for PDA's. This includes newspapers, magazines, trade journals, map makers, and travel publications.

However, there are significant problems with PDA's. They are expensive to purchase. Wireless access may be convenient, but it comes with a large monthly bill. Finally, there is very little security. It is not currently possible to encrypt information on a PDA.

3.3.3 Updating Service

Sandy Schlosser of the Consumer Union (creators of Consumer Reports) discussed how her library creates e-mail alert services for its Intranet. The librarians continually scan the relevant literature and create news updates, which are regularly delivered to interested staff members. The information is archived and searchable on the company's Intranet. One big advantage is that the librarians have become subject-matter experts in the organization.

3.3.4 Napster in ILL Land: Docster

Daniel Chudnov wrote an article entitled, "Docster: Instant Document Delivery" (http:/shylibrarian.com/ebooks/articles/docster.htm), where he discusses the possibility of using Napster-like technology in libraries. Computers in Libraries hosted two programs based upon this work. During those sessions, Chudnov explained that Napster is an Internet Relay Chat (IRC) channel. IRC protocols allow the server administrator to control who can log on and what they can transfer over the channel. Napster searches for songs using metadata nametags embedded in each MP3 file. The artist's name, the song's title, and other metadata are easily found in a standardized format at the beginning of each file.

Chudnov suggests that we use this technology to share electronic documents through a Napster-like server. Libraries already share documents by scanning them and sending them electronically with the Ariel system. Docster would take ILL one step further. The main advantage of this system is the ease of administration. Administrators could limit usage to only authorized users. They could also block unauthorized file transfers. Additionally, libraries could track usage of each document and then pay copyright fees accordingly. In order to better find a specific document, libraries would have to embed identifying metadata in each one, just like MP3 files. With Napster anyone can listen to all of the commercial recordings in the world. Even the most obscure recordings can be found there. Docster would allow libraries to go one step further and share all the knowledge of the world.

Notes

Tomas Lipinski and Roy Tennant rounded out the Docster programs. Lipinski gave the audience a legal overview by explaining secondary and vicarious copyright infringing. He explained that Napster itself does not infringe on copyrights, rather they are liable for leading people to material that infringes on copyrights. He suggested that libraries should also avoid referring people to online sites with infringing materials.

Tennant finished the program by talking about Gnutella and peer-to-peer networking. Gnutella has no nexus of control. Instead people share access to files over the web's HTTP protocols. Roughly 40,000 computers use Gnutella every day. The only way to stop them would be to destroy the web. He explained that he found everything he searched for on Gnutella, including a full text copy of the Harry Potter novels. Tennant believes that Gnutella will end copyright as we know it. He also believes that copy protection software cannot work. For example, hackers recently broke the copy protection programs embedded in DVD films. (For more about DVD copyright protection see the Copyleft organization's website (http://www.copyleft.net/index.phtml).

Tennant sees libraries playing a key role in a world without effective copyright rules. Much of the information online is inaccurate or could be falsified. Free online books could be fakes. On the other hand, libraries only provide authorized copies of books. In the world of peer-to-peer sharing libraries will remain the comprehensive source of authority.

3.3.5 The Real Dirt about the Conference

This review only covered some of the highlights of the conference. There were several other topics discussed, including cataloging electronic resources, knowledge management, online training, and web design. Several practical tips such as the fact that standard library jargon like "ILL" and "open stacks" confuse most people. It also discovered that the best way to overcome that problem is to define these terms with mouse rollovers. These are Javascript programs that change the display when the mouse passes over a section of a webpage.

As a whole, Computers in Libraries 2001 provided a valuable overview of library innovations. Like any conference, some of the programs were dull. Many of the speakers had viewpoints very different from mine. However, as a whole it was very informative. The conference highlighted those who are experimenting with cutting edge ideas. It provided me with an opportunity to see what non-law libraries are doing with technology. By the end of the conference I felt that I had learned about new technologies and applications.

3.3.6 Computer and Library

In computer science, a library is a collection of resources used to develop software. These may include pre-written code and subroutines, classes, values or type specifications.

Libraries contain code and data that provide services to independent programs. This encourages the sharing and changing of code and data in a modular fashion, and eases the distribution of the code and data. Some executables are both standalone programs and libraries, but most libraries are not executable. Executables and libraries make references known as links to each other through the process known as linking, which is typically done by a linker.

Most compiled languages have a standard library although programmers can also create their own custom libraries. Most modern software systems of 2009 provide libraries that implement the majority of system services. Such libraries have commoditized the services which a modern application requires. As such, most code used by modern applications is provided in these system libraries.

The GPL linking exception allows programs which do not license themselves under GPL to link to libraries licensed under the exception without thereby becoming subject to GPL requirements.

Notes

Notes Libraries often contain a jump table of all the methods within it, known as entry points. Calls into the library use this table, looking up the location of the code in memory, then calling it. This introduces overhead in calling into the library, but the delay is so small as to be negligible.

The earliest programming concepts analogous to libraries were intended to separate data definitions from the program implementation. JOVIAL brought the "COMPOOL" (Communication Pool) concept to popular attention in 1959, although it adopted the idea from the large-system SAGE software. Following the computer science principles of separation of concerns and information hiding, "Comm Pool's purpose was to permit the sharing of System Data among many programs by providing a centralized data description."

Task What do you mean by the Real Dirt about the conference? Explain.

Self Assessment

Fill in the blanks:

1. In computer science, a library is a collection of ..... used to develop software.
2. RAM stands for ..... .
3. ROM stands for ..... .
4. Tennant sees libraries playing a key role in a world without effective ..... rules.

3.4 Summary

- The CPU, or central processing unit, can be designed or instructed to perform any number of different tasks.
- Chudnov suggests that we use this technology to share electronic documents through a Napster-like server. Libraries already share documents by scanning them and sending them electronically with the Ariel system.
- Docster would allow libraries to go one step further and share all the knowledge of the world.
- In computer science, a library is a collection of resources used to develop software. These may include pre-written code and subroutines, classes, values or type specifications.

3.5 Keywords

Input: This is a way to direct or inform the computer.

Memory: It can hold necessary reference information even while the computer is off.

E-books: The e-book's hyperlink ability wight help people learn a language by linking a traslation to a foreign language work.

Notes

3.6 Review Questions

1. Explain the characteristics of a computer.
2. Describe the features of computer in libraries 2001.
3. Write a short note on e-books.
4. What do you mean by updating service.

Answers: Self Assessment

1. resources
2. random access memory
3. read only memory
4. copyright

3.7 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
2. Ravichandra Rao, (IK): *Library automation.* New Delhi: Wiley Eastern.
3. Rowley, (J.) *The electronic library.* 4th ed. London: LA, 1998.
4. Satyanarayana, (NR): *A manual of computerisation in libraries.*

Online link

http://www.freezonal.com/characteristics-of-computer.html

http://ezinearticles.com/?Basic-Computer-Features-101&id=2304831

Notes

Unit 4: Classification of Computers

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Introduction

4.1 Classification of Computers

4.1.1 Based on Purpose

4.1.2 Based on Technology Used

4.1.3 Based on Size and Storage Capacity

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4.4 Review Questions

4.5 Further Readings

Objectives

After studying this unit, you will be able to:

- Discuss about the classification of computer
- Describe the function of mainframe computer
- Know about the netbook computer

Introduction

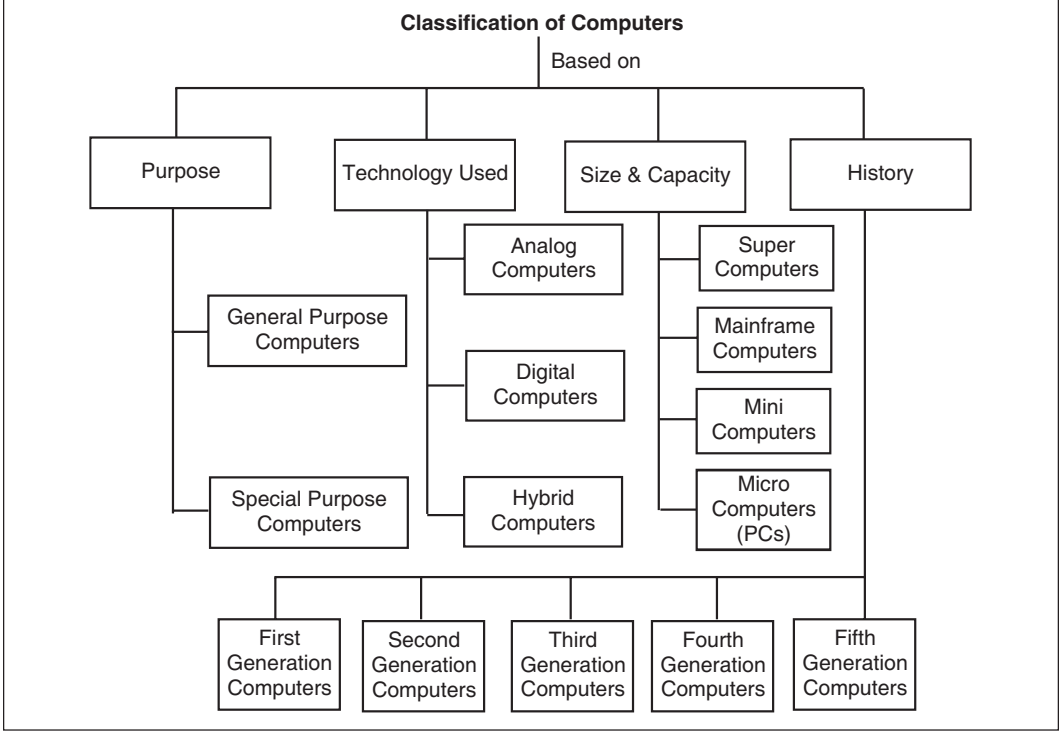
The types of computers range from the Hybrid to the Analog types. The computers you come across in the daily course of your day range from laptops, palmtops and towers, to desktop computers, to name a few. But the very word "computers" reminds one of the desktop computers used in offices or homes. Different categories of computes have been devised in keeping with our varied needs.

4.1 Classification of Computers

Computers are classified into various types based on purpose, technology used, size and storage capacity and historical development as illustrated in Figure 4.1. We have already discussed the six types of computers based on historical development. Let us categorise computers based on other criteria.

Notes

Figure 4.1: Classification of Computers Based on Different Criteria



4.1.1 Based on Purpose

According to the utilisation of computer for different uses, computers are of the following two types :

(*i*) ***General Purpose Computers.*** Computers that follow instructions for general requirements such as sales analysis, financial accounting, invoicing, inventory, management information etc. are called General Purpose Computers. Almost all computers used in offices for commercial, educational and other applications are general purpose computers.

(*ii*) ***Special Purpose Computers.*** Computers that are designed from scratch to perform special tasks like scientific applications and research, weather forecasting, space applications, medical diagnostics, etc. are called Special Purpose Computers.

4.1.2 Based on Technology Used

According to the technology used, computers are of the following three types:

(*i*) ***Analog Computers.*** Analog computers are special purpose computers that represent and store data in continuously varying physical quantities such as current, voltage or frequency. These computers are programmed for measuring physical quantities like pressure, temperature, speed etc. and to perform computations on these measurements. Analog computers are mainly used for scientific and engineering applications. Some of the examples of analog computers are given below:

(*a*) *Thermometer.* It is a simple analog computer used to measure temperature. In thermometer, the mercury moves up or down as the temperature varies.

Notes

(*b*) *Speedometer.* Car's speedometer is another example of analog computer where the position of the needle on dial represents the speed of the car.

(*ii*) ***Digital Computers.*** Digital computers are mainly general-purpose computers that represent and store data in discrete quantities or numbers. In these computers, all processing is done in terms of numeric representation (Binary Digits) of data and information. Although the user enters data in decimal or character form, it is converted into binary digits (0's and 1's). Almost all the computers used now a days are digital computers and we will discuss the detailed working and components of these computers in subsequent chapters.

(*iii*) ***Hybrid Computers.*** Hybrid computers incorporate the technology of both analog and digital computers. These computers store and process analog signals which have been converted into discrete numbers using analog-to-digital converters. They can also convert the digital numbers into analog signals or physical properties using digital-to-analog converters. Hybrid computers are mainly used in artificial intelligence (robotics) and computer aided manufacturing (*e.g.* process control).

4.1.3 Based on Size and Storage Capacity

Super Computer

Super computers are the type of computer which works at a faster rate and they are referred to as the fast computers. As these computers are quite fast so they are quite expensive to buy and even they are operated by those people who are particularly specialized in the usage of such computers. This type of computer is also meant for several calculations as it can solve all the problems at a higher speed.

The term "super computer" was coined in 1929 by the New York World, referring to tabulators manufactured by IBM. To modern computer users, these tabulators would probably appear awkward, slow, and cumbersome to use, but at the time, they represented the cutting edge of technology. This continues to be true of supercomputers today, which harness immense processing power so that they are incredibly fast, sophisticated, and powerful.

Use

The computer is mainly used for the mathematical and numerical functions as the supercomputers are very strong in calculations so they provide answer to each and every number that had been entered there. The main function of supercomputers is to provide each and everything to the person at the faster rate most of the time that is spent by the supercomputers is in the execution of the programs so that they can be opened at a faster rate. This is one of the most beneficial features which make a huge difference between the supercomputers and the other types of computers that had been invented so far. Super computers are very much efficient in solving all the problems that are complex and are scientific in nature.

Problem solving is another main feature of supercomputers. This computer has the fastest power for carrying out different operational activities. On the other hand all sort of problems that are somehow very much difficult for the person but are real in nature, so supercomputers provide solution to it. Different companies had been making different super computers but the most popular supercomputer till now had been invented by IBM which is the Roadrunner. Different activities and applications are found in supercomputers. However Cray Research had been the most famous person who had invented the fasts supercomputer which is used among most of the people.

The primary use for supercomputers is in scientific computing, which requires high-powered computers to perform complex calculations. Scientific organizations like NASA boast supercomputers the size of rooms for the purpose of performing calculations, rendering complex formulas, and performing other tasks which require a formidable amount of computer power. Some supercomputers have also been designed for very specific functions like cracking codes and playing chess; Deep Blue is a famous chess-playing supercomputer.

Notes

Today's fastest supercomputer operates at a speed of about 35 teraflops, that is 35 trillion floating point operations per second (a floating point operation is a mathematical operation, such as multiplication or division, on two high precision numbers). 35 trillion (35,000,000,000,000) operations per second sounds like a lot (it actually blows your mind), but you may be surprised that your new desktop computer from Walmart is only about 1000 times slower. That is, if you get 1000 of them to work together efficiently, you have a supercomputer. And that is exactly what many research institutions have done: putting together clusters of Linux based computers running on high performance Intel processors to obtain an affordable supercomputer.

Task What do you mean by classification of computer? Explain it.

Mainframe Computer

Mainframes (often colloquially referred to as "big iron" are powerful computers used primarily by corporate and governmental organizations for critical applications, bulk data processing such as census, industry and consumer statistics, enterprise resource planning, and financial transaction processing.

The term originally referred to the large cabinets that housed the central processing unit and main memory of early computers. Later the term was used to distinguish high-end commercial machines from less powerful units.

Most large-scale computer system architectures were firmly established in the 1960s. Several minicomputer operating systems and architectures arose in the 1970s and 1980s, which were known alternately as mini-mainframes or minicomputers; two examples are Digital Equipment Corporation's PDP-8 and the Data General Nova. Many defining characteristics of "mainframe" were established in the 1960s, but those characteristics continue to expand and evolve to the present day.

Description

Most modern mainframe design is not so much defined by single task computational speed, typically defined as MIPS rate or FLOPS in the case of floating point calculations, as much as by their redundant internal engineering and resulting high reliability and security, extensive input-output facilities, strict backward compatibility with older software, and high hardware and computational utilization rates to support massive throughput. These machines often run for long periods of time without interruption, given their inherent high stability and reliability.

Software upgrades usually require resetting the Operating System or portions thereof, and are non-disruptive only when using virtualizing facilities such as IBM's Z/OS and Parallel Sysplex, or Unisys' XPCL, which support workload sharing so that one system can take over another's application while it is being refreshed.

Did u know? Mainframes are defined by high availability, one of the main reasons for their longevity, since they are typically used in applications where downtime would be costly or catastrophic. The term reliability, availability and serviceability (RAS) is a defining characteristic of mainframe computers. Proper planning and implementation is required to exploit these features, and if improperly implemented, may serve to inhibit the benefits provided.

In addition, mainframes are more secure than other computer types. The NIST National Institute of Standards and Technology vulnerabilities database, US-CERT, rates traditional mainframes such as IBM zSeries, Unisys Dorado and Unisys Libra as among the most secure with vulnerabilities in the low single digits as compared with thousands for Windows, Linux and Unix.

Notes

In the 1960s, most mainframes had no explicitly interactive interface. They accepted sets of punched cards, paper tape, and/or magnetic tape and operated solely in batch mode to support back office functions, such as customer billing. Teletype devices were also common, for system operators, in implementing programming techniques. By the early 1970s, many mainframes acquired interactive user interfaces and operated as timesharing computers, supporting hundreds of users simultaneously along with batch processing. Users gained access through specialized terminals or, later, from personal computers equipped with terminal emulation software. By the 1980s, many mainframes supported graphical terminals, and terminal emulation, but not graphical user interfaces. This format of end-user computing reached mainstream obsolescence in the 1990s due to the advent of personal computers provided with GUIs. After 2000, most modern mainframes have partially or entirely phased out classic terminal access for end-users in favour of Web user interfaces.

Historically, mainframes acquired their name in part because of their substantial size, and because of requirements for specialized heating, ventilation, and air conditioning (HVAC), and electrical power, essentially posing a "main framework" of dedicated infrastructure. The requirements of high-infrastructure design were drastically reduced during the mid-1990s with CMOS mainframe designs replacing the older bipolar technology. IBM claimed that its newer mainframes can reduce data center energy costs for power and cooling, and that they could reduce physical space requirements compared to server farms.

Characteristics

The ability to run (or host) multiple operating systems, and thereby operate as a host of a collective of virtual machines. In this role, a single (via the z/VM operating system). Many mainframe customers run two machines: one in their primary data center, and one in their backup data center—fully active, partially active, or on standby—in case there is a catastrophe affecting the first building. Test, development, training, and production workload for applications and databases can run on a single machine, except for extremely large Mainframes are designed to handle very high volume input and output (I/O) and emphasize throughput computing.

Since the mid-1960s, mainframe designs have included several subsidiary computers (called channels or [[CDC 6600#Peripheral Processors.28PPs.29shops to deal with massive databases and files. Gigabyte to terabyte-size record files are not unusual. Compared to a typical PC, mainframes commonly have hundreds to thousands of times as much data storage online, and can access it much faster. Other server families also offload I/O processing and emphasize throughput computing.

Notes Mainframe return on investment (ROI), like any other computing platform, is dependent on its ability to scale, support mixed workloads, reduce labor costs, deliver uninterrupted service for critical business applications, and several other risk-adjusted cost factors.

Mainframes also have execution integrity characteristics for fault tolerant computing. For example, z900, z990, System z9, and System z10 servers effectively execute result-oriented instructions twice, compare results, arbitrate between any differences (through instruction retry and failure isolation), then shift workloads "in flight" to functioning processors, including spares, without any impact to operating systems, applications, or users. This hardware-level feature, also found in HP's NonStop systems, is known as lock-stepping, because both processors take their "steps" (*i.e.,* instructions) together. Not all applications absolutely need the assured integrity that these systems provide, but many do, such as financial transaction processing.

Personal Computer

A personal computer (PC) is any general-purpose computer whose size, capabilities, and original sales price make it useful for individuals, and which is intended to be operated directly by an end-

Notes

user with no intervening computer operator. In contrast, the batch processing or time-sharing models allowed large expensive mainframe systems to be used by many people, usually at the same time. Large data processing systems require a full-time staff to operate efficiently.

Software applications for personal computers include, but are not limited to, word processing, spreadsheets, databases, Web browsers and e-mail clients, digital media playback, games, and myriad personal productivity and special-purpose software applications. Modern personal computers often have connections to the Internet, allowing access to the World Wide Web and a wide range of other resources. Personal computers may be connected to a local area network (LAN), either by a cable or a wireless connection. A personal computer may be a desktop computer or a laptop, tablet, or a handheld PC.

While early PC owners usually had to write their own programs to do anything useful with the machines, today's users have access to a wide range of commercial software and free software, which is provided in ready-to-run or ready-to-compile form. Since the early 1990s, Microsoft software and Intel hardware have dominated much of the personal computer market, first with MS-DOS and then with the Wintel platform. Alternatives to Microsoft's Windows operating systems include Apple's Mac OS X and the open-source Linux OSes. AMD is the major alternative to Intel's central processing units. Applications and games for PCs are typically developed and distributed independently from the hardware or OS manufacturers, whereas software for many mobile phones and other portable systems is approved and distributed through a centralized online store.

In July and August 2011, marketing businesses and journalists began to talk about the 'Post-PC Era', in which the desktop form factor was being replaced with more portable computing such as netbooks, Tablet PCs, and smartphones.

Netbook Computers

Netbooks (also called mini notebooks or subnotebooks) are a rapidly evolving category of small, light and inexpensive laptop computers suited for general computing and accessing web-based applications; they are often marketed as "companion devices," that is, to augment a user's other computer access. Walt Mossberg called them a "relatively new category of small, light, minimalist and cheap laptops." By August 2009, CNET called netbooks "nothing more than smaller, cheaper notebooks.".

Initially, their primary defining characteristic was the lack of an optical disc drive, requiring it to be a separate and external device. This has become less important as flash memory devices have gradually increased in capacity, replacing the writable optical disc (*e.g.* CD-RW, DVD-RW) as a transportable storage medium.

At their inception in late 2007—as smaller notebooks optimized for low weight and low cost—netbooks omitted key features (*e.g.*, the optical drive), featured smaller screens and keyboards, and offered reduced specification and computing power. Over the course of their evolution, netbooks have ranged in size from below 5 in to over 13 in, and from ~1 kg (2–3 pounds). Often significantly less expensive than other laptops, by mid-2009, netbooks had been offered to users "free of charge", with an extended service contract purchase of a cellular data plan.

In the short period since their appearance, netbooks have grown in size and features, now converging with new smaller, lighter notebooks. By mid 2009, CNET noted "the specs are so similar that the average shopper would likely be confused as to why one is better than the other," noting "the only conclusion is that there really is no distinction between the devices."

Self Assessment

Fill in the blanks:

1. The term "Super Computer" was coine in ..... by the New York World.
2. Mainframe Computers were stablished in the ..... .

Notes

3. Analog computer are mainly used for ..... .
4. Personal computer may be connected to a ..... .

4.2 Summary

- Super computers are the type of computer which works at a faster rate and they are referred to as the fast computers.
- The term "super computer" was coined in 1929 by the New York World.
- Mainframes are designed to handle very high volume input and output (I/O) and emphasize throughput computing.
- Personal computers may be connected to a local area network (LAN), either by a cable or a wireless connection.

4.3 Keywords

Digital Computer: Digital computer are mainly general-purpose computers that represent and store data in discrete quantities or numbers.

Hybrid Computers: Hybrid computer incorporate the technology of both analog and digital computer.

Mainframe Computer: Mainframe were established in the 1960s, but those characteristic continue to expand and evolve to the present day.

4.4 Review Questions

1. What are the uses of super computer?
2. Write the role of mainframe computer.
3. Write a note on personal computer.
4. What do you mean by netbook computer?

Answers: Self Assessment

1. 1929 2. 1960s 3. scientific and engineering application
4. local area network

4.5 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
2. Ravichandra Rao, (IK): *Library automation.* New Delhi: Wiley Eastern.
3. Rowley, (J.) *The electronic library.* 4th ed. London: LA, 1998.
4. Satyanarayana, (NR): *A manual of computerisation in libraries.*

Online link

http://www.buzzle.com/articles/different-types-of-computers.html

http://computer-concepts-tutorial.blogspot.com

http://computeranditssolutions.blogspot.com

Notes

Unit 5: Computer Hardware

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Objectives

After studying this unit, you will be able to:

- Discuss about the input and output devices
- Know emerging input and output devices
- Understand the role of input and output devices

Introduction

All the elements that go together to make up a PC fall into one of two categories, hardware or software. Hardware is the stuff upon which software runs. Everything you can see and touch in your PC is hardware.

One of the definitions of 'hardware' according to Webster's dictionary is 'major items of equipment or their components used for a particular purpose'.

Computer hardware or hardware means the fixed parts that make up a computer.

5.1 Input and Output Devices

Notes

Input Devices are used to input data, information and instructions into the RAM. Common input devices include Keyboard, Mouse, Joystick, Trackball, Touch Screen, Light Pen, Digitizer, Scanner, Digital Camera, MICR (Magnetic Ink Character Recognition), OMR (Optical Mark Reader), OCR (Optical Character Reader), Bar Code Reader and Voice-Input Device. Input Devices are classified into the following two types :

(*a*) Basic Input Devices

(*b*) Special Input Devices

Output devices are hardware components, which are used to display or print the processed information. Common output devices include Monitor, Printer, Plotter, Speaker and COM (Computer Output Microfilm) device. Output devices are also classified into the following two types:

(*a*) Basic Output Devices

(*b*) Special Output Devices

In this unit, we are discussing below the structure, working and uses of these basic and special input/ output devices.

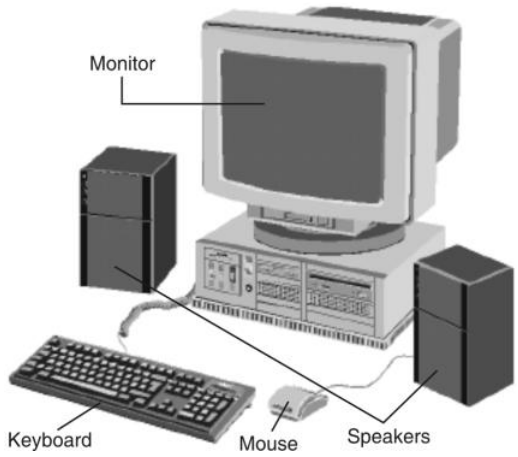
5.1.1 Basic Input Devices

The input devices, which have become now essential to operate a today's PC are called Basic Input Devices. These devices are always required for basic input operations. These devices include Keyboard, Mouse and Microphone. Today every PC has these devices as shown in Figure 5.1. Let us discuss them.

Keyboard

Keyboard is the main basic input device of a computer. It is the most commonly used means by which you can communicate with a computer. It consists of various types of keys that are operated through pressure applied by finger. When any key is pressed, an electronic signal is produced. A keyboard encoder that sends a binary code corresponding to the key pressed detects this signal.

Figure 5.1: A Personal Computer Having Basic Input Devices



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Types of Keyboards. There are mainly two types of Keyboard—QWERTY and Dvorak.

(*a*) *QWERTY Keyboard.* It is the most widely used standard keyboard throughout the world. It consists of the standard typewriter layout plus some additional keys. It contains three types of keys–alphanumeric keys, special keys and function keys. Alphanumeric keys such as A, B, C, 1, 2, etc. are used to type alphabets and numbers. *Special keys* such as <Shift>,<Ctrl>,<Alt>,<Home>, <Scroll Lock>, etc. are used for special functions. *Function keys* such as <F1>,<F2>,<F3>, etc. used to give special commands depending upon the software used. The location of various types of keys is shown in Figure 5.2. This keyboard is called QWERTY keyboard because the top of alphabet keys begin with the letters Q, W, E, R, T and Y.

Figure 5.2: A QWERTY Keyboard

(*b*) *Dvorak Keyboard.* The Dvorak keyboard is a keyboard layout developed by August Dvorak and William L. Delayed as an alternative to the popular QWERTY keyboard. The Dvorak keyboard was designed to speed typing by placing the most frequently used keys on the home row as shown in Figure 5.3. In addition the pair of letters that usually occur sequentially were separated so that the hands could alternate type them. Although the QWERTY keyboard is the standard world wide, in the future you may find using Dvorak keyboard easier and more efficient than QWERTY keyboard.

Figure 5.3: Keys Layout of the Dvorak Keyboard

!	@	#	$	%	^	&	*	(	)	[	+
1	2	3	4	5	6	7	8	9	0	]	=
“	<	>	P	Y	F	G	C	R	L	?	
‘	,	.	p	y	f	g	c	r	l	/	
A	O	E	U	I	D	H	T	N	S	_	
a	o	e	u	i	d	h	t	n	s	-	
:	Q	J	K	X	B	M	W	V	Z		
;	q	j	k	x	b	m	w	v	z		

Using QWERTY Keyboard. Today most PCs have QWERTY keyboard. The function of important keys on this keyboard are described below:

(*a*) *Using Arrow Keys.* Most keyboards provide two sets of arrow keys. The first set lies on bottom of the keyboard, while the second set lies on the numeric keypad. There are four arrow keys on each set-up. The Up Arrow key moves cursor on the previous row the Down Arrow key moves cursor on

Notes

the next row, the Left Arrow key moves cursor on the left character and the Right arrow key moves cursor on the right character while you work on a Word Processing document. Normally, you use first set of arrow keys. If you want to use the second set located on numeric keypad, you must press the NumLock key as described in the next point.

(*b*) *Using NumLock Key.* When you switch on the computer, the NumLock key is ON. It means you can use the number keys of the numeric keypad. To make the NumLock OFF press it. Now, the number keys work as arrow keys. So, the NumLock Key is a toggle key used to switch between functioning of arrow keys and number keys.

(*c*) *Using CapsLock Key.* CapsLock key is pressed to toggle between CapsLock operations ON or OFF. When CapsLock is ON (displaying a LED light), upper case letters are typed when you press alphabet keys otherwise lower case letters are typed.

(*d*) *Using the Shift Key.* When CapsLock is OFF, you can type any alphabet in upper case by simultaneous pressing and holding Shift key. Similarly you can type any alphabet in lower case even if CapsLock is ON. There are two Shift keys on the left and the right side of the keyboard as per the convenience of right-handed and left-handed users respectively. Shift key is also pressed to type the symbols written on upper position of number keys.

(*e*) *Using Ctrl and Alt Keys.* The function of these keys depend upon the operating system or software used. There are two sets of Alt and Ctrl keys just like Shift keys.

(*f*) *Using Function Keys.* There are 12 function keys on the keyboard. The function of these keys also depends upon the operating system or the program used.

(*g*) *Using Insert Key.* Insert key is used to toggle between insert mode and overwrite mode. When Insert key is ON, whatever you write is inserted between characters of the text. When Insert key is OFF, the existing characters are overwritten by the newly typed characters.

(*h*) *Using Delete and Backspace Key.* Backspace key is pressed to delete the existing text from the right most character. Delete key is pressed to delete the character on current cursor position.

(*i*) *Using Home and End Keys.* The function of these keys depend upon the software which you are using.

(*j*) *Using PageUp and PageDown Key.* PageUp key is pressed to go to the previous screen and PageDown key is pressed to go to next screen while you work in a word processor or other application software.

(*k*) *Using Tab Key.* Tab key is pressed when you want to jump a block of characters during typing of a text or document.

(*l*) *Using Esc Key.* Esc Key, which is located on the left most and the top most position of the keyboard, is pressed to cancel a command of a dialog box.

(*m*) *Combination of Various Keys.* Various keys can be used in a number of combinations for giving special commands of the software used. For example, Ctrl+S keys are pressed together to save a document; Ctrl+C keys are pressed to copy text of the document and Ctrl+Alt+Del keys are pressed to warm boot your system (for details on booting of the system, see chapter 8 – Software).

Mouse

Mouse is another basic input device of a computer. It is a pointing device used to move cursor, draw sketches/ diagrams, selecting a text/object/menu item, etc., on monitor screen while working on windows (graphics based operating environment of computer). Mouse is a small, palm size box containing three buttons and a ball underneath as shown in Figure 5.4 which senses the movement of the mouse and sends the corresponding signals to CPU on pressing the buttons.

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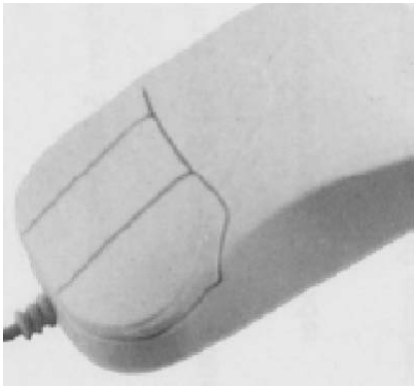
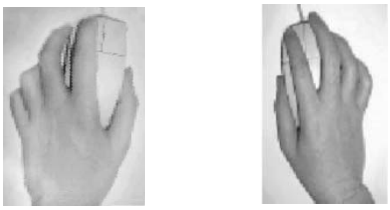
Figure 5.4: A Mouse



Using a Mouse. You can use the mouse in following ways:

(*a*) *Holding.* You can hold the mouse with right for left hand by putting your finger on the left button as shown in Figures 5.5 (*a*) and 5.5 (*b*).

Figure 5.5 (a) Holding Mouse with Left Hand (b) Holding Mouse with Right Hand



(a) (b)

(*b*) *Pointing.* When you slide the mouse on the mouse pad, the pointer or arrow moves on the screen.

(*c*) *Clicking.* Gently pressing and releasing the left mouse buttons, while keeping your hand on the mouse, is one of the ways to give a command to the computer. When you move the pointer over text, picture and menu, the arrow pointer changes to various shapes.

(*d*) *Double-click.* Pressing mouse button twice quickly is called double-click. Sometimes you need to double click the mouse on icon for giving some commands (*e.g.* opening a file).

(*e*) *Dragging.* Moving the mouse along with pressing and holding the left mouse button is called dragging. Sometimes you need to drag the mouse (*e.g.* while working on graphics).

Microphone

A microphone (sound recorder) is also a basic Voice-input device of computer. It is used to store voice data consisting of recorded message or synthesized sound using a GUI operating system such as Windows as shown in Figure 5.6. Microphone converts sound waves into analog electrical signals, which are further converted to digital form in a PC.

Notes

Figure 5.6: A View of Windows Screen for Recording of Voice

5.1.2 Special Input Devices

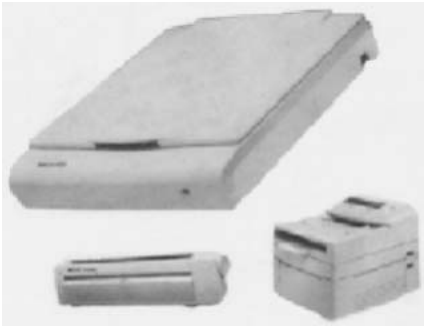
The input devices, which are not essential to operate a PC are called Special Input Devices. These devices are required for special input operations. These devices include Scanner, Digital Camera, Touch Screen, Light Pen, Trackball, Joystick, Digitizer, Optical Mark Reader, Optical Character Reader, Bar Code Reader and Magnetic Ink Character Recognition (MICR) Device. Let us discuss these.

Scanner

Scanner is widely used in Desktop Publishing (DTP) applications. It is used for digitising images such as photographs, forms, documents, etc. into computer memory. There are many types of scanners as shown in Figure 5.7. Some scanners can also read text by converting them to digital code. The scanners are very useful for converting the typed pages into word-processing files.

Did u know? Graphics scanners convert a printed image into video image without converting it to digital code. You also need the software to install and use the scanner

Figure 5.7: Various Types of Scanners



Scanning of Images. A scanner is somehow like a photocopy machine. A photocopy machine copies the contents of one page to another while a scanner stores the copy as an electronic image within a file on disk. For displaying an image, the monitor combines different shades of three basic colours (Red, Green and Blue), representing upto 16-million different colours. When you scan an image, your scanner determines the image's red, green, and blue colour components, and then saves them

Notes

to a file on disk. Although most new scanners determine an image's colour components in one step, you can think of a scanner using three steps. The image's colour components are determined by reflecting red, green and blue lights from the image. The image's red, green, and blue components are combined to build the composite image. You can also scan an image with various resolutions depending upon the scanner used. The image is sharper when resolution is high, but the size of image file becomes large.

Scanning of Text. A scanner can be used to scan the paper documents. The scanner creates an electronic image of the document. So, a graphic file is created always whether you scan a picture or a document. In order to create text from the scanned document, you need special software called OCR (*Optical Character Recognition*) software. This software converts the image into text. This converted text is never 100% accurate (because some character are not scanned correctly) and needs to be edited using a word processor. The scanned paper documents can also be used with fax software for sending electronic image to another user using a PC. As scanners are cheaper than fax machines, most people prefer them for sending faxes.

Built-in Scanner. Now-a-days, some PCs have built-in photographic scanner within the system unit. In such scanners, you can insert the photo or document into the scanner's slot just like an ATM machine.

Digital Camera

Digital Camera is a type of camera that records images in an electronic format, storing the images either on a disk or on a special memory, called *flash memory.*

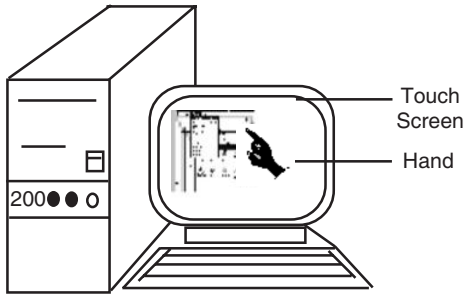
A digital camera uses a CCD (Charge-coupled Device) element to capture the image through the lens when the photographer releases the shutter in the camera. The image captured by the camera can be transferred to the PC in two ways, depending upon how the camera store them. If the camera stores the images on the floppy disk, you can simply insert the floppy disk in your PC disk drive and copy to the hard disk. If the camera stores the images in its flash memory (A small plastic device having 8 to 32 MB memory), they are downloaded by the cable connected to your PCs serial port using the software supplied with the camera.

Notes As the electronic images captured by digital camera can be manipulated and processed much like the image from a scanner, the digital camera is a popular input device of multimedia computer.

Touch Screen

Some special VDU devices have touch sensitive screens. These screens are sensitive to human fingers and act as tactile input devices. Using the touch screen, a user can point to a selection on the screen instead of pressing keys as shown in Figure 5.8. Touch screen helps the user in getting the information quickly. It is mainly used in hotels or airports to convey information to visitors.

Figure 5.8: Demonstration of Touch Screen

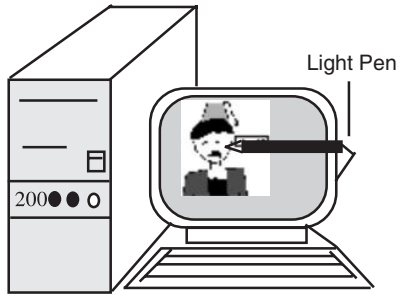


Notes

Light Pen

Light pen (similar to a pen) is a pointing device, which is used to select a displayed menu item or draw pictures on the monitor screen as shown in Figure 5.9. It consists of a photocell and an optical system placed in a small tube. When its tip is moved over the monitor screen and pen button is pressed, its photocell-sensing element detects the screen location and sends the corresponding signal to the CPU.

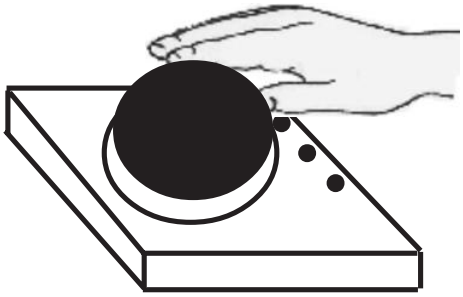
Figure 5.9: Demonstration of a Light Pen



Trackball

A trackball looks like a mouse, as the roller is on the top with selection buttons on the side as shown in Figure 5.10. It is also a pointing device used to move the cursor and works like a mouse. For moving the cursor in a particular direction, the user spins the ball in that direction. It is sometimes considered better than mouse, because it requires little arm movement and less desktop space. It is generally used with portable computers.

Figure 5.10: A Trackball

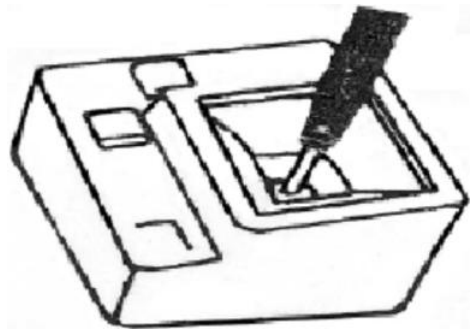


Joystick

Joystick is also a pointing device, which is used to move cursor position on a monitor screen. Joystick is a stick having a spherical ball at its both lower and upper ends as shown in Figure 5.11. The lower spherical ball moves in a socket. The joystick can be moved in all four directions. The function of joystick is similar to that of a mouse. It is mainly used in Computer Aided Designing (CAD) and playing computer games.

Notes

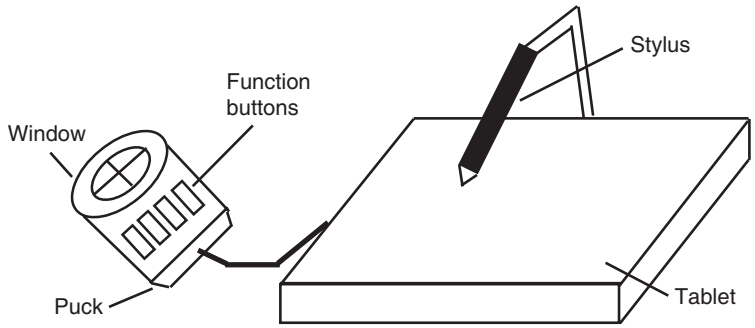
Figure 5.11: A Joystick



Digitizer

Digitizer is used to create drawings and pictures using a digitizer tablet by a process called *digitizing.* Digitizing is a process by which graphic representations are converted into digital data. The digitizer consists of 3 main parts—a flat surface called *tablet*, a small hand held mouse-like device called *puck* and a special pen like device called *stylus* as shown in Figure 5.12. The puck is used to input existing drawings into the computer. The stylus is used to trace existing drawings placed on the tablet. It is also used to draw new drawings on a piece of paper placed on tablet. The user makes contact to the tablet with stylus. As the stylus is connected to the tablet by a wire, the traced image is stored in RAM and displayed on the monitor.

Figure 5.12: A Digitizer



Optical Mark Reader (OMR)

Optical Mark Reader is a special type of optical scanner used to recognise the type of mark made by pen or pencil. It is used where one out of a few alternatives is to be selected and marked. It is especially used for checking the answer sheets of examination having multiple choice questions. The answer sheet contains special marks such as squares or bubbles. The student fills in these squares with soft pencil or ink to indicate the correct choice as shown in Figure 5.13. The OMR detects these marks and sends the corresponding signals to the processor. If a mark is present, the amount of reflected light is reduced and, thus, OMR detects the presence of mark for each and every answer. Optical Mark Readers are widely used for almost all-competitive examinations having objective type questions.

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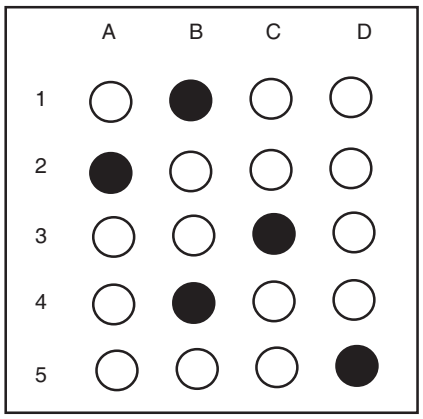
Figure 5.13: A Sample of Answer Sheet that is Checked by Optical Mark Reader (OMR).



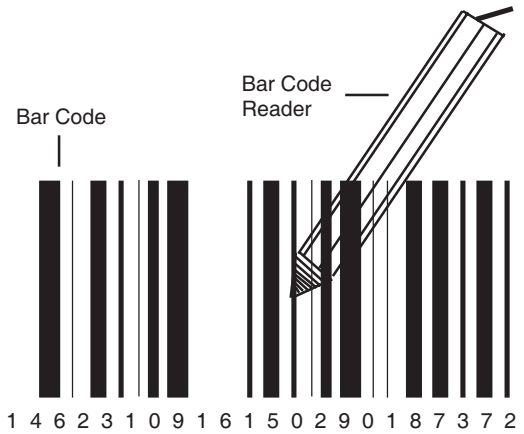
Optical Character Reader (OCR)

Optical Character Reader is an optical scanner, which is capable of detecting alphanumeric characters typed or printed on paper using an OCR font. The text, which is to be scanned is illuminated by a low-frequency light source. The dark areas on the text absorb the light while light areas reflect it. The photocells of OCR device receive this reflected light and provide binary data corresponding to dark and light areas. OCR devices are used for large volume applications like reading of passenger tickets, computer printed bills of credit card companies and reading of ZIP codes in postal services.

Bar Code Reader

Bar Code Reader is an optical scanner used for reading bar-coded data (data in form of light and dark lines) as shown in Figure 5.14. The bar-coded data consists of a number of bars of varying thickness and spacing between them. The bar code reader reads the bar coded data and converts it into electrical pulses, which are then processed by computer. Bar-coded data is generally used in labeling goods, numbering the books or encoding ID or A/c numbers.

Figure 5.14: A Bar Code Reader



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Magnetic Ink Character Recognition (MICR)

Magnetic Ink Character Recognition is used to recognise the magnetically-charged characters, mainly found on bank cheques as shown in Figure 5.15. The magnetically-charged characters are written by a special ink called magnetic ink. MICR device reads the patterns of these characters and compares them with special patterns stored in memory. Using MICR device, a large volume of cheques can be processed in a day. MICR is widely used by the banking industry for the processing of cheques.

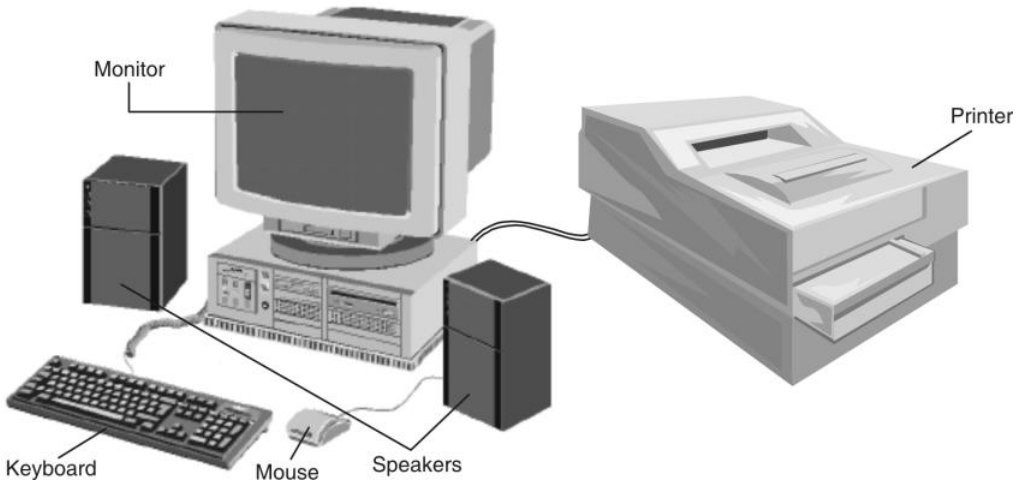
Figure 5.15: A Cheque Showing Magnetically-charged Characters that can be Read by an MICR Device

Magnetically-Charged Characters

5.1.3 Basic Output Devices

The output devices, which have become now essential to get the output on a today's PC are called Basic Output Devices. These devices are mostly required for basic output operations. These devices include Monitor, Printer and Speakers/Headphone as shown in Figure 5.16. Let us discuss them.

Figure 5.16: A Computer with Basic Output Devices



Monitor

Visual Display Unit (VDU), commonly called monitor is the main output device of a computer. It consists of a Cathode Ray Tube (CRT), which displays characters as output. It forms images from

Notes

tiny dots, called *pixels,* that are arranged in a rectangular form. The sharpness of the image (screen resolution) depends upon the number of the pixels.

Types of Monitors. There are different kinds of monitors depending upon the number of pixels. Depending upon the resolution, monitors can be classified as follows:

1. CGA (Color Graphics Adapter)
2. MDA (Monochrome Display Adapter)
3. HGA (Hercules Graphics Adapter)
4. EGA (Enhanced Graphics Adapter)
5. VGA (Video Graphics Adapter)
6. SVGA (Super VGA)

The differences between these monitors are outlined in Table 5.1. Depending upon colour of display, monitors can be classified as Monochrome (with single color black/white display) and Color (with all colours display) Monitors. The pictures of two different models of color monitors are shown in Figure 5.17.

Table 5.1: Comparison Among Different Types of Monitors

Type of Monitor	Display Type	Text Resolution	Graphics Resolution (Pixels)
CGA	Text & Graphics	Fair quality	320 × 200
MDA	Text only	Good quality	—
HGA	Text & Mono Graphics	Fair quality	320 × 200
EGA	Text & Enhanced Graphics	Good quality	640 × 350
VGA	Text & Video Graphics	Much better than all the above	640 × 480
SVGA	Text & Video Graphics	Best quality	1600 × 1280

Figure 5.17 Two Models of Color Monitors

15" Multimedia Color Monitor

20" Color Monitor

Printer

Printer is the basic output device, which is used to print information on papers. Printers are essential for getting output of any computer-based application. There are many types of printers, which are classified on various criteria as illustrated in Figure 5.18. Printers are broadly categorised into two types—Impact and Non-impact printers. Let us discuss these in detail.

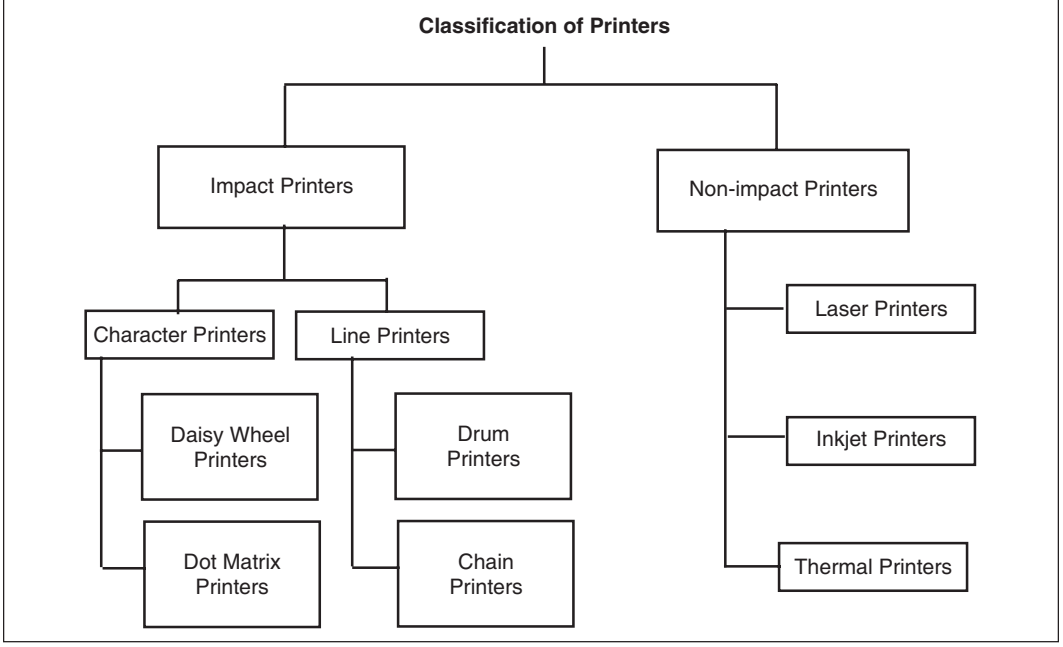
Notes

(*i*) Impact Printers. The printers that print the characters by striking against the ribbon and onto the paper, are called Impact Printers. These printers are of two types—(*a*) Character; and (*b*) Line printers.

(*a*) *Character Printers.* These printers print one character at a time. These printers can be further classified into two types–Daisy Wheel and Dot Matrix Printers.

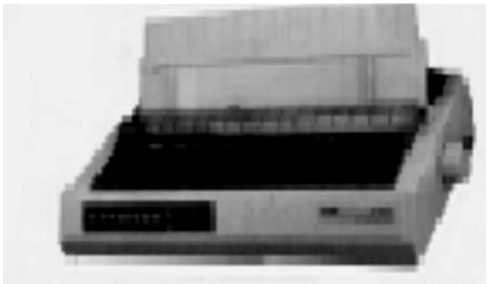
Daisy Wheel Printers. These printers print the characters by a mechanism, called *daisy wheel* that uses a plastic or metal hub with spokes. The characters are embossed on the radiating spokes and printed by striking these spokes against the ribbon and paper. Daisy Wheel printers give a good quality but they are expensive than Dot Matrix printers.

Figure 5.18: Classification of Printers



Dot Matrix Printers. These printers print the characters by putting dots onto the paper. They do not give better printing quality than daisy wheel printers, but are faster in speed. The printing speed of a dot matrix printer can be upto 360 cps (characters per second). They are widely used with microcomputers in most of the offices. A picture of a dot matrix printer is shown in Figure 5.19.

Figure 5.19: A dot Matrix Printer



(*b*) *Line Printers.* These printers print one line at a time. Their printing speed is much more than character printers. A picture of a line printer is shown in Figure 5.20. They are also of two types–Drum Printers and Chain Printers.

Notes

Figure 5.20: A line Printer

Drum Printers. These printers print the line by a rotating drum having a ring of characters for each print position. The hammer strike each character of the drum simultaneously so that entire line is printed for one full rotation of the drum. These printers are also called *Barrel Printers*. The printouts obtained from these printers have even character spacing but uneven line height.

Chain Printers. These printers print the line by a rotating chain having ring of characters for each print position. Their printing mechanism is similar to drum printers. The printouts obtained from these printers have uneven character spacing but even line height.

(*ii*) **Non-impact Printers.** The printers that print the characters without striking against the ribbon and onto the paper, are called Non-impact Printers. These printers print a complete page at a time, therefore, also called as *Page Printers*. Page printers are of three types—(*a*) Laser Printers, (*b*) Inkjet Printers, and (*c*) Thermal Printers.

(*a*) *Laser Printers.* These printers look and work like photocopiers as shown in Figure 5.21. They are based on laser technology, which is the latest development in high speed and best quality printing. In these printers, a laser beam is used to write the image on a paper. First, the image is formed by electrically charging thousands of dots on a paper by laser beam. Then, the paper is sprayed with a toner having the opposite charge and is passed over a heated roller to make the image permanent.

Figure 4.21: A laser Printer

Notes

Laser printers are very popular and have become an essential part of Desk Top Publishing (DTP). Although laser printers are costlier than dot matrix, they are generally preferred in all offices due to their best quality of printing. There are many models of laser printers depending upon the speed and number of dots printed. The latest model of laser printer is 1200 DPI (Dots Per Inch), which can print 10 pages/minute. Some high speed laser printers give a speed of upto 100 pages/minute.

(*b*) *Inkjet Printers.* These printers print the characters by spraying the paper with electrically charged ink. These printers give better quality than character printers but not better than laser printers. They are cheaper than laser printers, hence, used widely in many offices. They also offer an option of using colour cartridges for multi-color printing. A picture of an inkjet printer is shown in Figure 5.22.

Figure 5.22: An inkjet Printer

(*c*) *Thermal Printers.* These printers print the characters by melting a wax-based ink off a ribbon onto a special heat sensitive paper. They give Letter quality printing but are relatively expensive in maintenance than other printers.

Speakers/Headphone

Speakers is another basic output device of Today's computer, which is used to produce sound and music. There are many models of stereo speakers with different size and volume capacities (350 W, etc.).

Headphone is also a basic output device of a computer, which is used mainly on Internet to listen sound and music. It generally comes as a set with a microphone.

5.1.4 Special Output Devices

The output devices, which are not essential to get the output on a computer, are called Special Output Devices. These devices are not required for basic output operations, but are used for special purposes. These devices include Plotter and Computer Output Microfilm (COM). Let us discuss about them.

Plotter

Plotter is an important output device, used to print high quality graphics and drawings. Although the graphics can be printed on printers, the resolution of such printing is limited on printers. Plotters are generally used for printing/drawing graphical images such as charts, drawings, maps, etc. of engineering and scientific applications. Some important types of plotters are shown in Figure 5.23 and are discussed below:

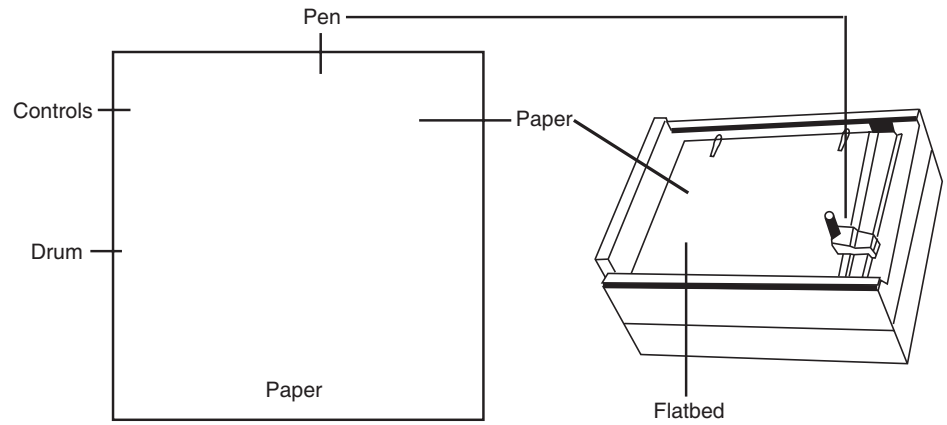
Notes

(*i*) **Flat Bed Plotters.** These plotters print the graphical images by moving the pen on stationary flat surface material. They produce very accurate drawings.

(*ii*) **Drum Plotters.** These plotters print the graphical images by moving both the pen and the drum having paper. They do not produce as accurate drawings as printed by flat bed plotters.

(*iii*) **Inkjet Plotters.** These plotters use inkjets in place of pens. They are faster than flat bed plotters and can print multi-colored large drawings.

Figure 5.23 Various Types of Plotters

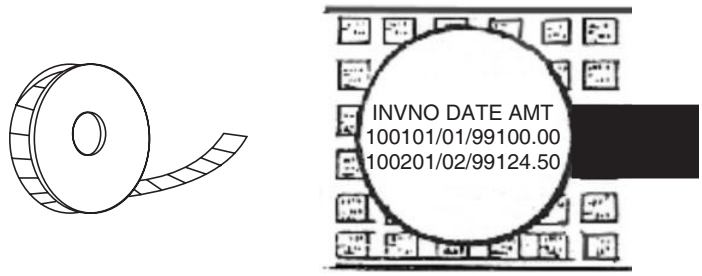


Computer Output Microfilm (COM)

Computer Output Microfilm (COM) is a technique to produce output on a microfilm media (microfilm reel or microfiche card) as shown in Figure 5.24. A microfilm is a continuous film strip that can store several thousands miniaturized document pages. A microfiche card is a 4 by 6 inch film sheet, which can store several hundred pages.

The process of producing microfilm or microfiche takes place on a special COM unit. The information recorded on the microfilm is read with the help of a microfilm viewing system. It is generally easier to read a microfiche than microfilm. Computer Output Microfilm is particularly useful for organisations, which need to store and manipulate large amount of data. It helps them in tremendous savings in paper and document handling costs.

Figure 5.24: Computer Output Microfilm



Notes

Task Name some of the output devices used with computer systems. Explain their applications.

5.2 Emerging Input/Output Devices

Recently major advances have been made recently in input and output technology. The emerging input devices are :

1. ***Portable Screen.*** On this screen, you will be able to write and may become a reliable choice for input.

2. ***Voice Keyboard.*** You would be able to make your keyboard speakable using a software. The keyboard will speak your documents when you will type them. So, it will help you to avoid typing errors.

3. ***Speech Recognition Devices/Software.*** These devices/software will recognise your speech and convert voice-data into digital form. Although these software are still available, they are not very reliable.

4. ***Language Translator Devices/Software.*** Scientists are trying to develop such devices/software, which would translate input given in are language into another.

5. ***Handwriting Recognition Devices/Software.*** These devices/software would recognise your handwriting precisely and store the text in the computer.

The emerging output devices are described below:

1. ***High Resolution LCD Monitor.*** Scientists are trying to develop new kinds of liquid crystals that will provide high resolution LCD (Liquid Crystal Display) monitor.

2. ***Flat-panel Monitor.*** These monitors could be mounted on walls and would have extremely high resolution. The whole wall of your room could become a monitor.

3. ***Retinal Monitor.*** These monitors would focus the output directly on to the retina of eye. This technology called *Virtual Retinal Display (VRD)* is still under Research and Development.

5.3 Role of Input and Output Devices

You know, CPU (Central Processing Unit) is the main part of all types of computers. It can not function without input and output devices. Therefore, input and output devices are the peripherals or peripheral devices of a computer. Although the detailed function of various input and output devices have been explained in the unit, we are summarising them in Table 5.2.

Table 5.2: Function of Various Input and Output Devices of a PC

Name of Device	Input/Output	Function
Keyboard	Input Device	Standard device of every PC, used to enter data and to give commands.
Mouse	Input Device	Pointing devices used to move cursor, draw diagrams, select menu items, etc. while working on Windows.
Microphone	Input Device	Voice-input device used to record sound.
Scanner	Input Device	Used to scan document and photograph by converting them into electronic images.

Notes

Digital Camera	Input Device	Used to record images in an electronic format
Touch screen	Input Device	Used to point to a selection.
Light Pen	Input Device	Used to select a menu item or draw figure on the monitor screen
Trackball	Input Device	Pointing device that works like a mouse.
Joystick	Input Device	Pointing device used in CAD and playing games on a PC.
Digitizer	Input Device	Used to create drawings and pictures
OMR	Input Device	Optical scanner used to recognise the type of make made by pen or pencil
OCR	Input Device	Optical scanner, used to detect typed or printed characters.
Bar Code Reader	Input Device	Used to read bar-coded data generally found on goods.
MICR	Input Device	Used to recognise the magnetically charged character found mainly on cheques.
Monitor	Output Device	Standard device of all PCs for displaying information on screen.
Printer	Output Device	Standard device for all computers for printing information on Papers.
Speaker and Headphone	Output Devices	Used to hear sound and music on a multimedia computer on Internet
Plotter	Output Device	Used to print high equality drawings
COM	Output Device	Used to produce output on a microfilm media.

Self Assessment

Fill in the blanks:

1. Keyboard is the main basic ..... of a computer.
2. Bar code Reader is used for reading data in the form of light and ..... .
3. Digitizer is used to create drawings and pictures using a ..... .
4. Monitor is the basic ..... of a computer.

5.4 Summary

- Keyboard is the main basic input device of a computer. It is the most commonly used means by which you can communicate with a computer.
- Microphone converts sound waves into analog electrical signals, which are further converted to digital form in a PC.
- Scanner is widely used in Desktop Publishing (DTP) applications. It is used for digitising images such as photographs, forms, documents, etc. into computer memory.
- Digital Camera is a type of camera that records images in an electronic format, storing the images either on a disk or on a special memory, called *flash memory.*
- Optical mark reader is a special type of optical scanner used to recognise the type of mark made by pen or pencile.

Notes

- Printer is the basic output device, which is used to print information on papers. Printers are essential for getting output of any computer-based application.

5.5 Keywords

QWERTY Keyboard: It is consists of the standard typewriter layout plus some additional keys.

Dvorak Keyboard: The Dvorak keyboard was designed to speed typing by placing the most frequently used keys on the home row.

Joystick: Joystick is also a pointing device, which is used to move cursor position on a monitor screen.

Plotter: Plotter is an important output device, used to print high quality graphics and drawings.

5.6 Review Questions

1. Name the basic input devices of a PC and explain their functions in brief.
2. What is a trackball ? How does it differ from mouse and joystick?
3. Explain the difference between Character, Line and Page Printers. Give examples.
4. Compare the advantages and limitations of a mouse and a keyboard as data input devices.
5. What is a QWERTY keyboard? How does it differ from Dvorak keyboard?
6. What is scanner ? How does it work?
7. Describe the working of a Digital Camera.
8. Write the functions of the following input devices:
   (*a*) MICR
   (*b*) Bar Code Reader
9. What is a plotter? Describe various types of plotters.
10. Write a short note on emerging input and output devices of computer.

Answers: Self Assessment

1. input device
2. dark line
3. digitizer tablet
4. output device

5.7 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
2. Ravichandra Rao, (IK): *Library automation.* New Delhi: Wiley Eastern.
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Unit 6: Computer Software

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6.2 Application Software

6.3 Application Software Classification

6.4 Software and Library

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Objectives

After studying this unit, you will be able to:

- Know about the system software
- Discuss the application software
- Understand the classification of application software

Introduction

Software is a program or set of instructions, which is required to use the computer. Many types of software are available for various applications. The software development field is so advanced that day by day existing software are becoming outdated and new software are coming in the market. So, we must get aware of the latest developments in the software industry.

6.1 System Software

System software refers to the files and programs that make up your computer's operating system. System files include libraries of functions, system services, drivers for printers and other hardware, system preferences, and other configuration files. The programs that are part of the system software include assemblers, compilers, file management tools, system utilites, and debuggers.

Notes

The system software is installed on your computer when you install your operating system. You can update the software by running programs such as "Windows Update" for Windows or "Software Update" for Mac OS X. Unlike application programs, however, system software is not meant to be run by the end user. For example, while you might use your Web browser every day, you probably don't have much use for an assembler program (unless, of course, you are a computer programmer).

Since system software runs at the most basic level of your computer, it is called "low-level" software. It generates the user interface and allows the operating system to interact with the hardware. Fortunately, you don't have to worry about what the system software is doing since it just runs in the background. It's nice to think you are working at a "high-level" anyway.

6.2 Application Software

Application software, also known as an application or an "app", is computer software designed to help the user to perform specific tasks. Examples include enterprise software, accounting software, office suites, graphics software and media players. Many application programs deal principally with documents. Apps may be bundled with the computer and its system software, or may be published separately. Some users are satisfied with the bundled apps and need never install one.

Did u know? Application software is contrasted with system software and middleware, which manage and integrate a computer's capabilities, but typically do not directly apply them in the performance of tasks that benefit the user. The system software serves the application, which in turn serves the user.

Similar relationships apply in other fields. For example, a shopping mall does not provide the merchandise a shopper is seeking, but provides space and services for retailers that serve the shopper. Rail tracks similarly support trains, allowing the trains to transport passengers.

Application software applies the power of a particular computing platform or system software to a particular purpose. Some apps such as Microsoft Office are available in versions for several different platforms; others have narrower requirements and are thus called, for example, a Geography application for Windows or an Android application for education or Linux gaming. Sometimes a new and popular application arises which only runs on one platform, increasing the desirability of that platform. This is called a killer application.

Terminology

In information technology, an application is a computer program designed to help people perform an activity. An application thus differs from an operating system (which runs a computer), a utility (which performs maintenance or general-purpose chores), and a programming language (with which computer programs are created). Depending on the activity for which it was designed, an application can manipulate text, numbers, graphics, or a combination of these elements. Some application packages offer considerable computing power by focusing on a single task, such as word processing; others, called integrated software, offer somewhat less power but include several applications. User-written software tailors systems to meet the user's specific needs. User-written software include spreadsheet templates, word processor macros, scientific simulations, graphics and animation scripts. Even email filters are a kind of user software. Users create this software themselves and often overlook how important it is.

The delineation between system software such as operating systems and application software is not exact, however, and is occasionally the object of controversy. For example, one of the key questions in the United States v. Microsoft antitrust trial was whether Microsoft's Internet Explorer web browser

Notes

was part of its Windows operating system or a separable piece of application software. As another example, the GNU/Linux naming controversy is, in part, due to disagreement about the relationship between the Linux kernel and the operating systems built over this kernel. In some types of embedded systems, the application software and the operating system software may be indistinguishable to the user, as in the case of software used to control a VCR, DVD player or microwave oven. The above definitions may exclude some applications that may exist on some computers in large organizations. For an alternative definition of an app: see Application Portfolio Management.

Task Explain the difference between system and application software with example.

6.3 Application Software Classification

Application software falls into two general categories; horizontal applications and vertical applications. Horizontal applications are the most popular and widespread in departments or companies. Vertical applications are niche products, designed for a particular type of business or division in a company.

There are Many Types of Application Software:

An application suite consists of multiple applications bundled together. They usually have related functions, features and user interfaces, and may be able to interact with each other, *e.g*. open each other's files. Business applications often come in suites, *e.g*. Microsoft Office, OpenOffice.org and iWork, which bundle together a word processor, a spreadsheet, etc.; but suites exist for other purposes, *e.g*. graphics or music.

Enterprise software addresses the needs of organization processes and data flow, often in a large distributed environment. (Examples include financial systems, customer relationship management (CRM) systems and supply-chain management software). Note that Departmental Software is a sub-type of enterprise software with a focus on smaller organizations or groups within a large organization. Examples include travel expense management and IT Helpdesk)

Enterprise infrastructure software provides common capabilities needed to support enterprise software systems. (Examples include databases, email servers, and systems for managing networks and security.)

Information worker software addresses the needs of individuals to create and manage information, often for individual projects within a department, in contrast to enterprise management. Examples include time management, resource management, documentation tools, analytical, and collaborative. Word processors, spreadsheets, email and blog clients, personal information system, and individual media editors may aid in multiple information worker tasks.

Content access software is software used primarily to access content without editing, but may include software that allows for content editing. Such software addresses the needs of individuals and groups to consume digital entertainment and published digital content. (Examples include Media Players, Web Browsers, Help browsers and Games)

Educational software is related to content access software, but has the content and/or features adapted for use in by educators or students. For example, it may deliver evaluations (tests), track progress through material, or include collaborative capabilities.

Notes Simulation software are computer software for simulation of physical or abstract systems for either research, training or entertainment purposes.

Notes

Media development software addresses the needs of individuals who generate print and electronic media for others to consume, most often in a commercial or educational setting. This includes graphic-art software, desktop publishing software, multimedia development software, HTML editors, digital-animation editors, digital audio and video composition, and many others.

Product engineering software is used in developing hardware and software products. This includes computer-aided design (CAD), computer-aided engineering (CAE), computer language editing and compiling tools, integrated development environments, and application programmer interfaces.

Applications can also be classified by computing platform such as a particular operating system, delivery network such as in cloud computing and Web 2.0 applications, or delivery devices such as mobile apps for mobile devices.

The operating system itself can be considered application software when performing simple calculating, measuring, rendering, and word processing tasks not used to control hardware via command-line interface or graphical user interface. This does not include application software bundled within operating systems such as a software calculator or text editor.

6.4 Software and Library

In computer science, a library is a collection of resources used to develop software. These may include pre-written code and subroutines, classes, values or type specifications.

Libraries contain code and data that provide services to independent programs. This encourages the sharing and changing of code and data in a modular fashion, and eases the distribution of the code and data. Some executables are both standalone programs and libraries, but most libraries are not executable. Executables and libraries make references known as links to each other through the process known as linking, which is typically done by a linker.

Most compiled languages have a standard library although programmers can also create their own custom libraries. Most modern software systems of 2009 provide libraries that implement the majority of system services. Such libraries have commoditized the services which a modern application requires. As such, most code used by modern applications is provided in these system libraries.

The GPL linking exception allows programs which do not license themselves under GPL to link to libraries licensed under the exception without thereby becoming subject to GPL requirements.

Libraries often contain a jump table of all the methods within it, known as entry points. Calls into the library use this table, looking up the location of the code in memory, then calling it. This introduces overhead in calling into the library, but the delay is so small as to be negligible.

Linking

Libraries are important in the program linking or binding process, which resolves references known as links or symbols to library modules. The linking process is usually automatically done by a linker or binder program that searches a set of libraries and other modules in a given order. Usually it is not considered an error if a link target can be found multiple times in a given set of libraries. Linking may be done when an executable file is created, or whenever the program is used at run time.

The references being resolved may be addresses for jumps and other routine calls. They may be in the main program, or in one module depending upon another. They are resolved into fixed or relocatable addresses (from a common base) by allocating runtime memory for the memory segments of each module referenced.

Notes

Some programming languages may use a feature called smart linking wherein the linker is aware of or integrated with the compiler, such that the linker knows how external references are used, and code in a library that is never actually used, even though internally referenced, can be discarded from the compiled application. For example, a program that only uses integers for arithmetic, or does no arithmetic operations at all, can exclude floating-point library routines. This smart-linking feature can lead to smaller application file sizes and reduced memory usage.

When linking is done during the creation of an executable or another object file, it is known as static linking or early binding. In this case, the linking is usually done by a linker, but may also be done by the compiler. A static library, also known as an archive, is one intended to be statically linked. Originally, only static libraries existed. Static linking must be performed when any modules are recompiled.

All of the modules required by a program are sometimes statically linked and copied into the executable file. This process, and the resulting stand-alone file, is known as a static build of the program. A static build may not need any further relocation if virtual memory is used and no address space layout randomization is desired.

Memory Sharing

Library code may be shared in memory by multiple processes as well as on disk. If virtual memory is used, processes execute the same physical page of RAM, mapped into the different address spaces of each process. This has advantages. For instance on the OpenStep system, applications were often only a few hundred kilobytes in size and loaded quickly; the majority of their code was located in libraries that had already been loaded for other purposes by the operating system.There is a cost, however; shared code must be specifically written to run in a multitasking environment. In some older environments such as 16-bit Windows or MPE for the HP 3000, only stack based data (local) was allowed, or other significant restrictions were placed on writing a shared library.

Programs can accomplish RAM sharing by using position independent code as in Unix, which leads to a complex but flexible architecture, or by using common virtual addresses as in Windows and OS/2. These systems make sure, by various tricks like pre-mapping the address space and reserving slots for each shared library, that code has a great probability of being shared. A third alternative is single-level store, as used by the IBM System/38 and its successors. This allows position-dependent code but places no significant restrictions on where code can be placed or how it can be shared.

In some cases different versions of shared libraries can cause problems, especially when libraries of different versions have the same file name, and different applications installed on a system each require a specific version. Such a scenario is known as DLL hell, named after the Windows and OS/2 DLL file. Most modern operating systems after 2001, have clean-up methods to eliminate such situations.

Dynamic Linking

Dynamic linking or late binding refers to linking performed while a program is being loaded (load time) or executed (run time), rather than when the executable file is created. A dynamically linked library (dynamic-link library or DLL under Windows and OS/2; dynamic shared object or DSO under Unix-like systems) is a library intended for dynamic linking. Only a minimum amount of work is done by the linker when the executable file is created; it only records what library routines the program needs and the index names or numbers of the routines in the library. The majority of the work of linking is done at the time the application is loaded (load time) or during execution (run

Notes

time). The necessary linking program, called a dynamic linker or linking loader, is actually part of the underlying operating system.

Self Assessment

Fill in the blanks:

1. System software runs at the most basic level of your computer, it is called ..... software.
2. Application software, also known as ..... .
3. Some application packages offer considerable computing power by focusing on a single task, called ..... .
4. When linking is done during the creation of an executable or another object file it is known as..... .

6.5 Summarys

- The system software is installed on your computer when you install your operating system.
- Application software, also known as an application or an "app", is computer software designed to help the user to perform specific tasks.
- Application software falls into two general categories; horizontal applications and vertical applications.
- In computer science, a library is a collection of resources used to develop software.
- Libraries are important in the program linking or binding process, which resolves references known as links or symbols to library modules.
- When linking is done during the creation of an executable or another object file, it is known as static linking or early binding.

6.6 Keywords

System Software: System software refers to the files and grograms that wake up your computer's operating system.

Application Software: Application software, also known as an application or an "app" is computer software designed to help the user to perform spefic tasks.

Linking: Libraries are important in the program linking or binding process, which resolves references known as links or symbols to library modules.

6.7 Review Questions

1. What are system software utilities?
2. Explain the classification of application software.
3. Write a note on linking.
4. What do you mean by memory sharing? Explain.

Notes

Answers: Self Assessment

1. low-level
2. an application or an "app"
3. integrated software
4. static linking

6.8 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
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Notes

Unit 7: Windows Operating Systems

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Objectives

After studying this unit, you will be able to:

- Know about the concept of windows operating systems
- Describe the operating system functions
- Explain the operating system types
- Discuss about the flowchart

Introduction

Microsoft Windows is a series of operating systems produced by Microsoft.

Microsoft introduced an operating environment named Windows on November 20, 1985 as an add-on to MS-DOS in response to the growing interest in graphical user interfaces (GUIs) Microsoft Windows came to dominate the world's personal computer market, overtaking Mac OS, which had been introduced in 1984. As of October 2009, Windows had approximately 90% of the market share of the client operating systems for usage on the Internet.

7.1 Definition of Windows Operating Systems

Notes

An operating system (OS) is a set of programs that manage computer hardware resources and provide common services for application software. The operating system is the most important type of system software in a computer system. A user cannot run an application program on the computer without an operating system, unless the application program is self booting.

Time-sharing operating systems schedule tasks for efficient use of the system and may also include accounting for cost allocation of processor time, mass storage, printing, and other resources.

For hardware functions such as input and output and memory allocation, the operating system acts as an intermediary between application programs and the computer hardware, although the application code is usually executed directly by the hardware and will frequently call the OS or be interrupted by it. Operating systems are found on almost any device that contains a computer—from cellular phones and video game consoles to supercomputers and web servers.

Examples of popular modern operating systems include Android, iOS, Linux, Mac OS X, and Microsoft Windows.

Types

Real-time

A real-time operating system is a multitasking operating system that aims at executing real-time applications. Real-time operating systems often use specialized scheduling algorithms so that they can achieve a deterministic nature of behavior. The main objective of real-time operating systems is their quick and predictable response to events. They have an event-driven or time-sharing design and often aspects of both. An event-driven system switches between tasks based on their priorities or external events while time-sharing operating systems switch tasks based on clock interrupts.

Multi-user vs. Single-user

A multi-user operating system allows multiple users to access a computer system concurrently. Time-sharing system can be classified as multi-user systems as they enable a multiple user access to a computer through the sharing of time. Single-user operating systems, as opposed to a multi-user operating system, are usable by a single user at a time. Being able to have multiple accounts on a Windows operating system does not make it a multi-user system. Rather, only the network administrator is the real user. But for a Unix-like operating system, it is possible for two users to login at a time and this capability of the OS makes it a multi-user operating system.

Multi-tasking vs. Single-tasking

When only a single program is allowed to run at a time, the system is grouped under a single-tasking system. However, when the operating system allows the execution of multiple tasks at one time, it is classified as a multi-tasking operating system. Multi-tasking can be of two types: pre-emptive or co-operative. In pre-emptive multitasking, the operating system slices the CPU time and dedicates one slot to each of the programs. Unix-like operating systems such as Solaris and Linux support pre-emptive multitasking. Cooperative multitasking is achieved by relying on each process to give time to the other processes in a defined manner. MS Windows prior to Windows 2000 used to support cooperative multitasking.

Distributed

A distributed operating system manages a group of independent computers and makes them appear to be a single computer. The development of networked computers that could be linked and communicate with each other gave rise to distributed computing. Distributed computations are carried out on more than one machine. When computers in a group work in cooperation, they make a distributed system.

Notes

Embedded

Embedded operating systems are designed to be used in embedded computer systems. They are designed to operate on small machines like PDAs with less autonomy. They are able to operate with a limited number of resources. They are very compact and extremely efficient by design. Windows CE and Minix 3 are some examples of embedded operating systems.

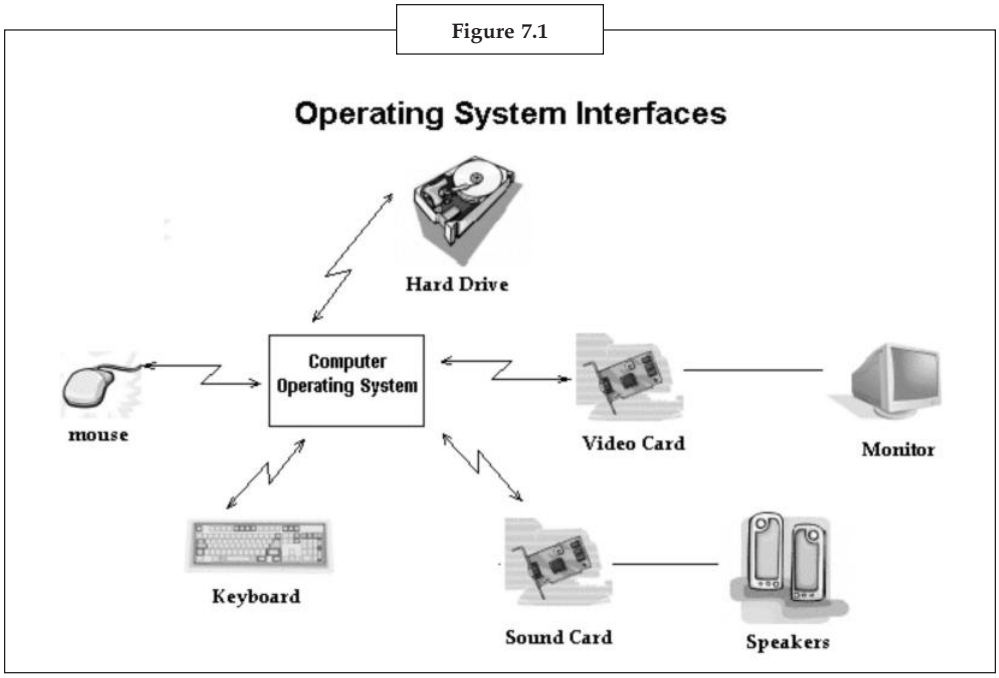
7.2 Operating System Functions

The operating system is the core software component of your computer. It performs many functions and is, in very basic terms, an interface between your computer and the outside world. In the section about hardware, a computer is described as consisting of several component parts including your monitor, keyboard, mouse, and other parts. The operating system provides an interface to these parts using what is referred to as "drivers". This is why sometimes when you install a new printer or other piece of hardware, your system will ask you to install more software called a driver.

Driver

A driver is a specially written program which understands the operation of the device it interfaces to, such as a printer, video card, sound card or CD ROM drive. It translates commands from the operating system or user into commands understood by the the component computer part it interfaces with. It also translates responses from the component computer part back to responses that can be understood by the operating system, application program, or user. The below diagram gives a graphical depiction of the interfaces between the operating system and the computer component.

Figure 7.1



Other Operating System Functions

The operating system provides for several other functions including:

- System tools (programs) used to monitor computer performance, debug problems, or maintain parts of the system.
- A set of libraries or functions which programs may use to perform specific tasks especially relating to interfacing with computer system components.

Notes

Notes The operating system makes these interfacing functions along with its other functions operate smoothly and these functions are mostly transparent to the user.

7.3 Operating System Concerns

An operating system is a computer program. Operating systems are written by human programmers who make mistakes. Therefore there can be errors in the code even though there may be some testing before the product is released. Some companies have better software quality control and testing than others so you may notice varying levels of quality from operating system to operating system. Errors in operating systems cause three main types of problems:

- ***System Crashes and Instabilities:*** These can happen due to a software bug typically in the operating system, although computer programs being run on the operating system can make the system more unstable or may even crash the system by themselves. This varies depending on the type of operating system. A system crash is the act of a system freezing and becoming unresponsive which would cause the user to need to reboot.
- ***Security Flaws:*** Some software errors leave a door open for the system to be broken into by unauthorized intruders. As these flaws are discovered, unauthorized intruders may try to use these to gain illegal access to your system. Patching these flaws often will help keep your computer system secure. How this is done will be explained later.
- Sometimes errors in the operating system will cause the computer not to work correctly with some peripheral devices such as printers.

7.4 Operating System Types

There are many types of operating systems. The most common is the Microsoft suite of operating systems. They include from most recent to the oldest:

- ***Windows XP Professional Edition:*** A version used by many businesses on workstations. It has the ability to become a member of a corporate domain.
- ***Windows XP Home Edition:*** A lower cost version of Windows XP which is for home use only and should not be used at a business.
- ***Windows 2000:*** A better version of the Windows NT operating system which works well both at home and as a workstation at a business. It includes technologies which allow hardware to be automatically detected and other enhancements over Windows NT.
- ***Windows ME:*** A upgraded version from windows 98 but it has been historically plagued with programming errors which may be frustrating for home users.
- ***Windows 98:*** This was produced in two main versions. The first Windows 98 version was plagued with programming errors but the Windows 98 Second Edition which came out later was much better with many errors resolved.
- ***Windows NT:*** A version of Windows made specifically for businesses offering better control over workstation capabilities to help network administrators.
- ***Windows 95:*** The first version of Windows after the older Windows 3.x versions offering a better interface and better library functions for programs.

There are other worthwhile types of operating systems not made by Microsoft. The greatest problem with these operating systems lies in the fact that not as many application programs are written for

Notes

them. However if you can get the type of application programs you are looking for, one of the systems listed below may be a good choice.

- ***Unix:*** A system that has been around for many years and it is very stable. It is primary used to be a server rather than a workstation and should not be used by anyone who does not understand the system. It can be difficult to learn. Unix must normally run an a computer made by the same company that produces the software.
- ***Linux:*** Linux is similar to Unix in operation but it is free. It also should not be used by anyone who does not understand the system and can be difficult to learn.
- ***Apple MacIntosh:*** Most recent versions are based on Unix but it has a good graphical interface so it is both stable (does not crash often or have as many software problems as other systems may have) and easy to learn. One drawback to this system is that it can only be run on Apple produced hardware.

Task Explain the different types of operating system.

7.5 Algorithm

In mathematics and computer science, an algorithm is an effective method expressed as a finite list of well-defined instructions for calculating a function. Algorithms are used for calculation, data processing, and automated reasoning. In simple words an algorithm is a step-by-step procedure for calculations.

Starting from an initial state and initial input (perhaps empty), the instructions describe a computation that, when executed, will proceed through a finite number of well-defined successive states, eventually producing "output "and terminating at a final ending state. The transition from one state to the next is not necessarily deterministic; some algorithms, known as randomized algorithms, incorporate random input.

A partial formalization of the concept began with attempts to solve the problem (the "decision problem") posed by David Hilbert in 1928. Subsequent formalizations were framed as attempts to define "effective calculability"or "effective method";those formalizations included theGödel–Herbrand–Kleene recursive functions of 1930, 1934 and 1935, Alonzo Church's lambda calculus of 1936, Emil Post's "Formulation 1" of 1936, and Alan Turing's Turing machines of 1936–7 and 1939. Giving a formal definition of algorithms, corresponding to the intuitive notion, remains a challenging problem.

Algorithm and Library

Library sort, or **gapped insertion sort** is a sorting algorithm that uses an insertion sort, but with gaps in the array to accelerate subsequent insertions. The name comes from an analogy:

Suppose a librarian were to store his books alphabetically on a long shelf, starting with the As at the left end, and continuing to the right along the shelf with no spaces between the books until the end of the Zs. If the librarian acquired a new book that belongs to the B section, once he finds the correct space in the B section, he will have to move every book over, from the middle of the Bs all the way down to the Zs in order to make room for the new book. This is an insertion sort. However, if he were to leave a space after every letter, as long as there was still space after B, he would only have to move a few books to make room for the new one. This is the basic principle of the Library Sort.

The algorithm was proposed by Michael A. Bender, Martín Farach-Colton, and Miguel Mosteiro in 2006.

Notes

Did u know? Like the insertion sort it is based on, library sort is a stable comparison sort and can be run as an online algorithm; however, it was shown to have a high probability of running in O(n log n) time (comparable to quicksort), rather than an insertion sort's O(n^2). Its implementation is very similar to a skip list. The drawback to using the library sort is that it requires extra space for the gaps.

7.6 Flowchart

A **flowchart** is a type of diagram that represents an algorithm or process, showing the steps as boxes of various kinds, and their order by connecting these with arrows. This diagrammatic representation can give a step-by-step solution to a given problem. Process operations are represented in these boxes, and arrows connecting them represent flow of control. Data flows are not typically represented in a flowchart, in contrast with data flow diagrams; rather, they are implied by the sequencing of operations. Flowcharts are used in analyzing, designing, documenting or managing a process or program in various fields.

Flowcharts are used in designing and documenting complex processes. Like other types of diagram, they help visualize what is going on and thereby help the viewer to understand a process, and perhaps also find flaws, bottlenecks, and other less-obvious features within it. There are many different types of flowcharts, and each type has its own repertoire of boxes and notational conventions. The two most common types of boxes in a flowchart are:

- A processing step, usually called *activity*, and denoted as a rectangular box
- A decision, usually denoted as a diamond.

A flowchart is described as "cross-functional" when the page is divided into different swim lanes describing the control of different organizational units. A symbol appearing in a particular "lane" is within the control of that organizational unit. This technique allows the author to locate the responsibility for performing an action or making a decision correctly, showing the responsibility of each organizational unit for different parts of a single process.

Self Assessment

Fill in the blanks:

1. A user cannot run an application program on the computer without an ..... .
2. Your system will ask you to install more software call a ..... .
3. In simple words an ..... is a step-by-step procedure for calculation.
4. ..... are used in analyzing, designing documenting or managing a process or program in various fields.

7.7 Summary

- An operating system (OS) is a set of programs that manage computer hardware resources and provide common services for application software.
- A multi-user operating system allows multiple users to access a computer system concurrently.

Notes

- This is why sometimes when you install a new printer or other piece of hardware, your system will ask you to install more software called a driver.
- Algorithms are used for calculation, data processing, and automated reasoning.

7.8 Keywords

Embedded: Embedded operating systems are designed to be used in embedded computer systems.

Algorithm: In mathematics and computer science, an algorithm is an effective method expressed as a finite list of well-defined instructions for calculating a function.

Flowchart: A flowcharts are used in analyzing, designing document or managing a process or programs in various field.

7.9 Review Questions

1. What is an operating system?
2. Write short notes on real time operating system.
3. What is difference between multi-tasking and single-tasking
4. Define the functions of operating system.

Answers: Self Assessment

1. operating system
2. driver
3. algorithm
4. flowchart

7.10 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
2. Ravichandra Rao, (IK): *Library automation.* New Delhi: Wiley Eastern.
3. Rowley, (J.) *The electronic library.* 4th ed. London: LA, 1998.
4. Satyanarayana, (NR): *A manual of computerisation in libraries.*

Online link

http://www.johnrouda.com/class/PDF/CPT%20257/01600_IM_ch15.pdf
http://library.thinkquest.org/11309/data/operate.htm#function
http://www.nos.org/htm/basic2.htm

Unit 8: Programming Language: Types and Functions

Notes

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Objectives

After studying this unit, you will be able to:

- Discuss about programming language
- Derive aspects of programming language
- Explain hierarchy of programming languages
- Elaborate history of programming languages

Notes

Introduction

All computers need instructions in the manipulation of the data received. These instructions known as programmes or software will, for instance specify now information should be rearranged for machine storage and how to sort and format information to suitoutput specifications. Computer software are either systems software or applications software. The former are further subdivided as operating systems and programming languages. The activities of all the hardware and software resources in the computer system are coordinated by the operating systems software.

Each computer has its own language known as 'machine language'. 'Symbolic languages' are used for writing a program. A computer converts instructions in one of these languages into 'machine language' and starts its operation. The symbolic languages are further subdivided into 'assembler languages' and 'compiler languages'. Whereas assembler languages resemble machine languages, compiler languages relates closely to procedure being written in natural language. Assembler language is based on mnemonic codes for various instructions. There is one to one correspondence between assembly instruction and machine code. Compiler language, also known as high-level language is a general purpose procedure-oriented language. It is machine independent and makes the job of the application programmer simple.

A large number of high-level programming languages have been devised. For example; COBOL-74, FORTRAN-77, BASIC, PASCAL, PL/1, C language, SNOBOL, LISP, PROLOG, ALGOL, etc.

Similarly we have many 'application programmes'. For example dBASE, Word Star, Lotus, CDS/ISIS, etc. The important library and information oriented software packages are dBASE and CDS/ISIS.

CDS/ISIS (Computerised Documentation System/Integrated Set of Information System) was developed in 1975, and is maintained and distributed by the UNESCO's division of software Development and Application. It is a generalised system for information storage and retrieval of bibliographic data. The new version is called CDS/ISIS Mini Micro Version 2.3. This version allows the system to run on micro, mini and mainframe computers. Unesco has now empowered selected institutions to distribute CDS/ISIS free of cost throughout the world for promoting computerisation of activities and services in libraries and information centres. In India the package is distributed by NISSAT.

Mention may be made about the recent development of CDS/ISIS by DESIDOC called SANJAY and another by CMC called MAITHREYEE.

dBase was developed by Ashton-Tate during mid 1984. It is one of the large number of DBMS (Database Management Systems) products available for many personal computers and operating systems. dBASE IV is an advanced and fully featured DBMS for micro-computer users-from beginners to advanced application programmers and developers. While dBASE III had only 50 commands, dBase IV 245 commands. dBase also contains comperhensive applications generation facilities; an application of SQL (Structure Query Language); and a complete task-oriented environment for non-programming users. dBASE IV is 100 per cent compatible with dBASE III + data, index and program files. It offers efficient file organisation and data handling.

8.1 Programming Language

A **programming language** is an artificial language that can be used to control the behavior of a machine (often a computer). Like human languages, programming languages have syntactic and semantic rules used to define meaning. Programming languages are used to facilitate communication about the task of organizing and manipulating information, and to express algorithms precisely.

Notes

Some authors restrict the term "programming language" to those languages that can express *all* possible algorithms; sometimes the term "computer language" is used for more limited artificial languages. Thousands of different programming languages have been created and new ones are creating every year. Few languages ever become sufficiently popular that they are used by more than a few people, but professional programmers may use dozens of different languages during then careers. Let us come to known about some facts of programming languages.

Function: A programming language is a language used to write computer programs, which instruct a computer to perform some kind of computation and/or organize the flow of control between mechanical devices.

Target: Programming languages differ from natural languages in that natural languages are only used for interaction between people, while programming languages also allow humans to communicate instructions to machines. In some cases, programming languages are used by one program or machine to program another; Postscript source code, for example, is frequently generated programmatically to control a computer, printer or display.

Constructs: Programming languages may contain constructs for defining and manipulating data structures or for controlling the flow of execution.

Expressive power: The theory of computation classifies languages by the computations they can express. All Turing complete languages can implement the same algorithms. ANSI/ISO SQI and Charity are examples of languages that are not Turing complete yet often called programming languages.

Non-computational languages, such as markup languages like HTML or formal grammars like BNF, are usually not considered programming languages; however, informal usage sometimes includes them.

A prominent purpose of programming languages is to provide instructions to a computer. As such, programming languages differ from most other forms of human expression in that they require a greater degree of precision and completeness. When using a natural language to communicate with other people, human authors and speakers can be ambiguous and make small errors, and still expect their intent to be understood. However, computers do exactly what they are told to do, and cannot understand the code the programmer "intended" to write. The combination of the language definition, the program, and the program's inputs must fully specify the external behavior that occurs when the program is executed.

Many languages have been designed from scratch, altered to meet new needs, combined with other languages, and eventually fallen into disuse. Although there have been attempts to design one "universal" computer language that serves all purposes (*e.g.,* PL/I), all of them have faild to be accepted in this role. The need for diverse computer languages arises from the diversity of contexts in which languages are used: Programs range from tiny scripts written by individual hobbyists to huge systems written by hundreds of programmers. Programmers range in expertise from novices who need simplicity above all else, to experts who may be comfortable with considerable complexity. Programs must balance speed, size, and simplicity on systems ranging from microcontrollers to nearly constant modification. Finally, programmers may simply differ in their tastes: they may be accustomed to discussing problems and expressing them in a particular language. One common trend in the development of programming languages has been to add more ability to solve problems using a higher level of abstraction. The earliest programming languages were tied very closely to the underlying hardare of the computer. As new programming languages have developed, features have been added that let programmers express ideas that are more removed from simple translation into underlying hardware instructions. Because programmers are less tied to the needs of the computer, their programs can do more computing with less effort from the programmer. This lets them write more programs in the same amount of time. Natural language processors have been proposed as a way to eliminate the need for a specialized language for programming. However, this goal remains distant and its benefits are open to debate,

Notes

Notes Edsger Dijkstra took the position that the use of a formal language is essential to prevent the introduction of meaningless constructs.

A programming language can be defined as:

1. The act of extending or changing a system's functionality.

2. For a software system, it is the activity that starts with a specification and leads to its solution as a program.

This definition covers a lot both programming "in the small" and "in the large". It covers both (language-independent) architectural issues and (language-dependent) coding issues. It is unbiased by the limitations of any particular language, tool, or design methodology. Any notation for the description of algorithms and data structures may be termed as a programming language.

We define *programming*, as a general human activity, to mean the act of extending or changing a system's functionality. Programming is a widespread activity that is done both by non specialists (*e.g.,* consumers who change the settings of their alarm clock or cellular phone) and specialists (computer programmers, the audience of this book).

Programming as defined above has two essential parts: A technology and its scientific foundation. The technology consists of tools, practical techniques, and standards, allowing us to ***do*** programming. The science consists of a broad and deep theory with predictive power, allowing us to *understand* programming. Ideally, the science should explain the technology in a way that is as direct and useful as possible. If either part is left out, we are no longer doing programming. Without the technology, we are doing pure mathematics. Without the science, we are doing a craft, *i.e.,* we lack deep understanding. Teaching programming correctly therefore means teaching both the technology (current tools) and the science (fundamental concepts).

8.2 Why to Learn About Programming Languages

It is rightly said that "The necessity is the mother of invention". But one or the other way there are several facts that lets someone to learn something new everyday. Some of the features which force one to learn about programming languages are as follows:

- To appreciate the diversity of approaches to programming.
- To understand the cost of particular language features.
- To understand the connection between languages and the problem solving process.
- To suggest designs for languages suited to the needs of problem solving and software production.
- To permit a better choice of programming language for a particular problem.
- To understand the meaning of one language by comparing with others through development of semantic description tools.
- To understand how languages and features are implemented.
- To make it easier to learn new languages.
- To improve your ability to develop effective algorithms.
- To make better use of existing programming language.
- To increase your vocabulary of useful programming constructs.
- To make it easier to design a new language.

8.3 Aspects of Programming Languages

Notes

Programming Languages includes following aspects:

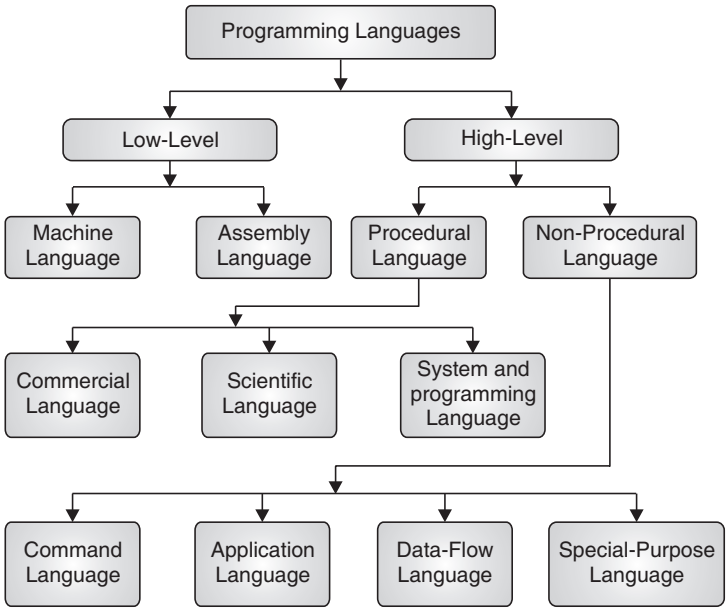
- A paradigm is a coherent set of methods found useful for solving problems in a given problem domain.
- *A paradigm is characterized by a principle;* this supplies the basis for a limited number of concepts, which allow infinitely many methods to be invented, which in their turn help the programmer in solving the problem at hand.
- *Grammar* describes the form of programs; semantics is attached to grammatical notions.
- *Syntactic structure* define the program text, the grammar defines a parsing, which recovers the notions and therewith the semantics.
- *Abstraction* is to ignore irrelevant detail in a safe way. This is done by hiding information behind an interface.

8.4 Hierarchy of Programming Languages

A set of instructions called program which when executed by the computer, do a spcific task. The instructions are written using various syntax and rules. Programming language provids the set of rules/syntax/ instruction format in which the various instructions are written. A sequential collection of instructions is called program. The program may be written in many languages. In Figure 8.1 a general hierarchy of programming languages is shown which gives the detailed of different languages. Programming languages may be divided into three broad categories:

1. Machine language
2. Assembly language
3. High Level language

Figure 8.1: Programming Languages Hierarchy



Notes

The user need of better advancement and application leads to the development of different categories of languages. These categories have different aspects and area of applications. If may be possible that a language belongs to one category car fulfill the needs of application that can also be fulfilled by the language of other category. This feature of languages provids a better choice of a language for a better application. We have shown some major differences in three major types of languages in Table 8.1.

Table 8.1: Comparison of High Level, Assembly, Machine Level Languages

High Level Language (HLL)	Assembly Language (AL)	Machine Level Language (MLL)
Program developed in HLL are most understandable.	Programs are less understandable than HLL but more than MLL.	Programs are less understandable.
Program are portable	Not portable, portable to processor of the same architectures only.	Not portable, portable to machine of the same architecture only.
Debugging is easier	Debugging is more complex than HLL.	Debugging is most difficult.
Most suited for software development.	Not good for large programs.	Difficult to write large programs.
Programs are not machine dependent.	Programs are machine dependent.	Programs are machine dependent.
Provides flexible construct for program development.	Does not provide flexible construct for development.	Not good.
Programs are translated using compiler and interpreter to generate object code.	Uses assembler to generate object code.	No translation is required.
Processing the slow since translation is required.	Processing is slow since translation is required.	Processing is fast since no translation is required.

8.5 History of Programming Languages

Let us have a glance on various domains of programming languages.

(*i*) **Numerically Based Languages**

Early computer technology dates from the era just before World War II in the late 1930s to early 1940s

- A-0 language- in early 1950 (Grace Hopper).
- FORTRAN by Backus in 1955.

Did u know? FORTRAN II (1958), FORTRAN IV-rename as FORTRAN 66 (1966)-FORTRAN-77. FORTRAN 90.

- IAL (International Algorithmic Language) by Peter Naur later named as ALGOL 58 Jules Own version of IAL or JOVIAL.

Notes

- BACKUS-editor of ALGOL.
- Simula 67-by Nygaard and Dahl of Norway introduced concept of classes to ALGOL.
- ALGOL-W-by writhe in mid 1960.
- Pascal by writhe 1968–70.
  - NPL (New PL)-1963 → MMPL (Multi-purpose PL) → PL/I-merged numerical attributes of FORTRAN with Business programming features of COBOL.

(*ii*) **Business Languages**

Business data processing was an early application area to develop after numerical calculation.

- FLOWMATIC by grace Hopper in 1955.
- Common Business Language (CBL).
- COBOL-1960-61-62-68-74-84.

(*iii*) **Artificial Intelligence Languages**

The development lead the man to the introduction of intelligence in computers and thus some AI languages developed.

- IPL (Information Processing Language) by rand crop in 1950 → IPL-V.
- LISP (List Processing) by Johan Mc earthy of MIT.
- COMIT by yngve of MIT (Automatic a long for M/C translation) SNOBOL PROLOG.

(*iv*) **Systems Language**

The requirement was for reliable and efficient systems to work with and this lead to the effective maintenance of these systems which gave birth to systems languages.

- BCPL, CPL, JOVIAL.

(*v*) **Publishing Language**

- TEX processing system.
- TEX translator produces a program in the postscript page description language.

(*vi*) **Scripting Languages (SL)**

SL is used by putting a list of commands called a script in a file to be executed.

- SH, KSH (by David Koran in 1995).
- GWK by ALAHO, Brain Kernighan 1988.
- TCL by JOHN.

(*vii*) **Fourth Generation Languages (4GL)**

The fourth generation languages are referred to as 4GL. The 4GL's are the shorthand programming languages. Any operation that requires hundred of lines of code in a third generation languages such as COBOL requires only fewer code lines in a 4GLs. some of its features are:

- Their prior generations were procedural and they are basically non procedural.
- It is easy ad fast.
- User just has to tell what is required rather than the way to get it.
- The productivity is the key characteristic of 4GLs. 4GLs can improve productivity by a factor of 5 to 50. An average improvement factor has come out to be 10. This means that a programmer can be ten times more productive if working in 4GLs rather than third generation language.
- Most 4GLs languages are used to retrieve the information from file and databases.

Notes

- They have instructions which can execute any query. Sometimes they are known as query language also.
- Some 4GLs languages have a report generator which generates the complex reports.
- Some 4GLs have the instructions to develop the graphical user interfaces.
- They are result oriented.
- They emphasize on result (what) rather than method (how).
- They improve productivity because code is easy to write and change.
- As the language is easy, simple, both programmers and non programmers can use them with a minimum of training.
- Transparency regarding the awareness of shareware and program structure.

8.6 Category of Programming Languages

There are some different sort of constructs which a language provides. There are often minor syntactic variations that shows the thinking of the language designers and then displays the effect upon the programms written in those languages. Now we have a look on different basic models that describes the behaviour of programming languages.

8.6.1 Imperative Languages

- ***Imperative programming specify everything:*** Data declarations, state-changing and flow of control.
- Aliasing binds more than one name to one item, overloading binds one name to more than one item. When using an overloaded name, the context determines which item it refers to: The context disambiguates.
- ***A type is a set of values:*** Often a set of operators is defined on it and sometimes an allocator and a destructor is defined for it.
- *There are basic types (integer, etc.):* More complex types can be made using type constructors.
- ***There is one type constructor that uss no other types:*** Enumeration.
- ***There are three type constructors that can use any number of types:*** Records, unions and procedures (routines).
- ***Records can be recursive through the use of pointers:*** In almost all languages pointers can also point to items of other data types.
- A pointer to an item of type T is an independent item of type pointer to T; and operation called 'dereference' is needed to access the item pointed to. A reference to an item of type T is just an alias for that item; it is of type T and no operation is required to access the item.
- Routines can be a data type in some languages. They can be passd as parameters and assigned to routine variables. The only operation on them is the routine call, supplying the parameters.
- ***Orthogonality:*** Two features are orthogonal if any example of the first feature can be freely and meaningfully combined with any example of the second feature.
- ***Restricted types:*** Have a subset of the values of the base type. More operations are allowed on the subset that on the original set.
- ***Signals:*** Asynchronous, usually with external cause. Exceptions: synchronous, with internal cause.

Notes

- Depending on the language, signals normally cause a user-provided routine to be called, smack in the middle of everything. Exceptions can be reduced to signals, but this is inelegant.
- An exception handler is attached to some unit, and is executed instead of the remainder of the unit when an exception occurs.
- Program holds module which contain routines which consist of blocks.
- Distinguish blocks, scopes and visibility ranges.
- There is no fundamental difference between functions and operators: operators are a special case of functions and functions are a special case of operators.
- Just as we have anonymous integer values or anonymous array values, we can have anonymous routine values.
- A module is like a record in that it provides a syntactic scope the names in which can be known outside that scope.
- ***Specification modules:*** Contain the information needed by user and compiler to use the items declared in the module. Implementation modules: contain the rest which compiled once and stored in a library.
- A module *contains* a data type with its routines. An abstract data type *is* a data type and contains its routines as some of its fields.
- A generic item is a template from which one or more items can be created at compile time through instantiation. This template has parameters, typed with a generic type. A generic type is not restricted to data types and can include such things as data type names, macro names, etc.
- In Icon, an expression yields a result *and* a suspended expression; the latter is invisible to the user, but is used by the system to obtain further results if the present result causes failure of some sort.
- Icon is very suitable for search and combinatorial problems.
- Prolog uses a stack rather than local and formal variables to store and pass data.

Notes Imperative languages are procedural, command-driven or statement oriented languages. *e.g.*, C, C++, FORTRAN, ALGOL, Ada, Pascal, Smalltalk. Support this model.

8.6.2 Object-Oriented Languages

- Object-orientation = abstract data type + inheritance + dynamic binding.
- Abstract data type = all info on the data is included in the type: constants, variables, access methods (procedures and functions). The variables are usually hidden form the user; access to them is through the access methods only.
- Inheritance = type extension.
- The idea behind object-Oriented Programming, (OOP) is that a computer program may be seen as comprising a collection of individual units or objects that act on each other.
- Each object is capable of receiving messages, processing data and sending messages to other objects.
- OOP is claimed to promote greater flexibility and maintainability in programming.
- Some languages like C++, Java, smalltalk etc support this model.

Notes

- Reference semantics = the object is represented by a pointer. When the user thinks he she passed an object, the pointer is passed.
- ***Overloading:*** A pointer to a base type object may also point to a derived type object, since the later has (at least) all the fields of the former. So all actions on the base type can also be performed on all derived types.
- ***Dynamic binding:*** When an action is applied to what seems a base type, the system remembers that it was actually a derived type (run-time info) and applies the action as redefined for the derived type.
- Use inheritance for "is a special kind of" relation. Use inclusion for the "has a" relation.
- Multiple inheritances mean that something is both a special kind of A and a special kind of B. This is rare. Much of the need for multiple inheritances can be satisfied by generics.

8.6.3 Functional Languages

- The program is a function from the input to the output.
- The same applies to all functions in the program → no side effects → the same input yields the'same output → it does not matter when exactly you calculate the results, as long as you have the input.
- Traditionally the special data structures for functional programming are lists; this makes polymorphism easier.
- The other main data type is of course functions, which means that functions are first class data types. Functions can have functions as parameters and yield them as results; lists can contain functions.
- ***Polymorphism:*** types need not be fully determined but can have Prolog-like type variables in them.
- ***Currying:*** all functions are considered to have only one parameter and to yield a function with one parameter less. → Constants are functions with zero parameters. This allows partial parameterization and simplifies the formalism.
- ***Lazy evaluation:*** An argument is not evaluated until its value is needed. This avoids superfluous work, prevents potential errors and is equivalent to top-down evaluation (substitute the function first, rather than substituting the arguments first.)
- ***Infinite lists:*** evaluate only as much as needed; this is made possible by lazy evaluation.
- *I/O:* consider them as infinite lists and evaluate/produce only the relevant part. This allows "I/O in languages without side effects".
- This model is supported by languages such as.

Did u know? Haskell, Erlang. Ocaml. Scheme, LISP, ML which are used in industry and commercial applications and some domain specific functional programming languages include mathematical (symbolic math). R(statistics), J and K (Financial analysis). Spreadsheet : can also be viewed as functional programming languages.

8.6.4 Logic Languages

- The domain is described as a set of condition, conclusion rules and a set of facts. The rules (and facts) may have logical variables in them. The actual "program" is a query asking for

values of these variables that make a given "conclusion with variables" true. Such a query is called a "goal".

Notes

- ***The search strategy:*** The system looks for rules that "match" the goal, to find rules that can give conditions under which the initial goal is true. It does this by trying to match the goal to the head (conclusion) of each rule, and if it fits, the conditions of this rule are new goals. When all goals have been,reduced to facts, the system has found a way (a set of variables) that make the original "conclusion with variables" true.
- ***Logical variables:*** Can be uninstantiated (uninitialized and the system knows it) or have a value bound to it (point to a data structure which may contain more logical variables). Also, two uninstantiated variables can be bound together.
- ***Goal-head matching:*** A rule matches a goal when the head of the rule can be unified with the goal ("it fits"). The result of this unification is the new goal, if it exists. If it does not, the ' system backtracks to the latest choice point.
- ***Unification:*** *A* goal and a head can be unified if their names are equal and their parameters can be unified pair wise. When both parameters are data structures, they can be unified if their names are equal and their components can be unified pair wise. There is no fundamental difference between unifying a goal and a head, and unifying two data structures.
- ***Unification of logical variables:*** If one is an uninstantiated variable and the other is a data structure, the variable is bound to the data structure. If both are uninstantiated variables, they are "bound together", so that if one gets bound in a later stage, so will the other. If both are bound to values (data structures) these data structures are unified. These bindings are undone when backtracking passes through them while retreating to an earlier choice point.
- Rules describe relations, which work two (or even more) ways. A "pure" Prolog program can be run from input to all possible outputs but equally well from output to all possible inputs.
- There are several impure features in Prolog which disturb and sometimes destroy the pure relational nature of logic programming.
- This model is supported by languages such as Prolog, Fril, Visual Prolog, Ciao. Mercury, Godel, Oz, ALF (Algebraic Logic Functional Programming Languages).

8.6.5 Parallel and Distributed Programming

- ***Parallel:*** Multiple CPUs around shared memory. Often the processes all do essentially the same, possibly even in lock step.
- ***Distributed:*** Multiple CPUs in a network. Often the processes do different things and communication times are higher.
- Parallel processes have to communicate. There are two basic methods for this: shared variables and message passing.
- ***Shared variables:*** They need synchronization measures. There is control synchronization ("wait until the data you need are there"), which waits for some other process to arrive, and mutual exclusion synchronization ("wait until the data you need are free") which waits for some other process to go away. There are locks, semaphores and monitors to do this, in order of increasing sophistication.
- ***Locks and semaphores:*** A semaphore is an integer on which the only actions allowed are "increase by 1" (V) and "decrease by 1" (P) and which can never become negative. Normally it is used to represent "the number of items available". If a P operation would make the semaphore negative if allowed to run to completion, the attempting process is suspended, and will be released as soon as somebody else does a V operation. In the long run there must be equally

Notes

many Ps as Vs; this is difficult to keep straight. (A lock is a one-bit semaphore; unlocking it twice is either an error or has no effect.)

- ***Monitors:*** A module or abstract data type that can be visited by only one process at a time. This solves the mutual exclusion but not the control synchronization. To solve the latter, processes which find they cannot continue execute a wait () on a condition variable, which puts them in a queue for that variable outside the monitor. If a process does something that might make a given condition true, it does a signal () on that condition, which alerts those in the queue for that condition. This is still difficult, but less so than semaphores.
- ***Message passing:*** The produced item (query, block of data or what not) is sent in a message to the other process. This provides control synchronization and mutual exclusion in one, and does not require shared memory, but is less efficient, and in some cases harder to use.
- The sender does a send (), the receiver may or may not do an explicit receive (). There are many choices to be made here: direct versus indirect naming of the parties involved; synchronous versus asynchronous communication; explicit versus implicit receive (); one-way versus two-way communication. The language SR has it all.
- ***Rendezvous (Ada):*** Two-way message passing with explicit receive. Remote procedure call (RPC): two way message passing with implicit receive.
- ***Linda:*** Implements a very specific shared object type, the tuple, with implicit guards and mutual exclusion. Orca: allows the user to implement their own shared object types, with explicit guards and implicit mutual exclusion.

8.7 Other Paradigms

- Paradigms can be classified according to how they access and manipulate the program state.
- ***Constraint Programming:*** Define the solution to your problem as a set of restrictions on the values in it. The system then has to find all the solutions that satisfy the restrictions.
- In practice the search space is too large and too badly structured for this to work.
- ***There are Two Ways Out:*** Restrict the domain to something simple: and require the programmer to structure the search space better by supplying condition-action rules.
- ***Access-Oriented Programming:*** Changing a variable causes actions that change other variables and that propagate to do the work for you.
- ***Single-Data-structure Languages:*** Simplify (?) programming by supplying one very powerful data type only. They are good for rapid prototyping.
- The sets of SETL provide breadth-first search, the OK/FAIL mechanism depth-first search.
- The SETL oracle function OK sets a choice (backtrack) point and returns TRUE. If a FAIL is then executed, it returns to the last choice point, clears it, and resumes the OK function, which now returns FALSE.
- ***Dataflow Programming:*** Each operator and function is implemented by a separate processor, which does its work as soon as the operands are available. This get you optimal fine-grained parallelism without programmer help. Also, all dataflow languages are single-assignment.
- Functional languages would be ideal dataflow languages but for one problem: They are recursive.
- ***First Solution:*** Do dynamic code copying when recursion is needed. This is done by tagging the variables with an incarnation tag.

Notes

- ***Second Solution:*** Forbid recursion, but allow iteration by other means. VAL does this by allowing a very limited form of reassignment, which creates new, tagged variables
- All variables in Lucid are streams, which make the idea of new values without reassignment come natural.

Task Write a Short note about Imperative language.

8.8 Functions

All programming languages have a set of constructs which allow the programmer to break up their code into smaller, more manageable, chunks which can be called by name and which may or may not return a value.

The purpose of these blocks is to decrease the complexity of a piece of code, and allow the programmer to reuse specific functions, rather than constantly repeating the same block of code performing a specific operation.

For example, a language that has no built-in command for displaying text will need to provide a function to interface with the operating system to display a text string. If there was no function for this, the programmer would need to copy the same code over and over each time they wanted to print something on the screen.

If the operating system changed in some way, they would have to change many pieces of code, unless a function was used, in which case they could just update the single block that is called each time output is required.

Functions are used extensively in computer languages and spreadsheets. Recall that a function takes an input, does some calculations on the input, and then gives back a result. In computer programming they are a very similar idea, with a few changes to naming and properties.

A function in a programming language is a program fragment that 'knows' how to perform a defined task. For example a function may be written that finds the average of three supplied numbers. Once written, this function may be used many times without having to rewrite it over and over.

Example-the Function avg

```
function avg(a,b,c)
{  var result =  (a+b+c)/3;
return result;
}
```

The above, written in Javascript, performs the average function. On the first line, the name of the function is 'avg', It expects three inputs called a,b and c. In computer programming these are called parameters; they stand for the three values sent when the function is used. The function has it's own private variable called result which is calculated from the parameters and then the function 'returns' the result;

Using the Function

In computer programming the act of using the function is "calling the function". In the program below there are two "calls" to the function. In each case, three particular values are sent as parameters and the result will be the average of the three.

Notes

```
/* main program*/
var  averageHt  =  avg (6,  4,  7) ;
. .
. .
. .
var  averageAge  =  avg (30,  45,  21) ;
. .
```

So as you can see, functions in computer programming and spreadsheets are very similar to those in math, and serve to 'package' some calculations so it can be separated and used over and over.

Self Assessment

Fill in the blanks:

1. A ..... is an artificial language that can be used to controul the behaviour of a machine.
2. ..... describes the form of programs, semantics is attached to grammatical notions.
3. The fourth generation languages are referred to as ..... .
4. ..... is a function from the input to the output.

8.9 Summary

- ***Programming as defined above has two essential parts:*** A technology and its scientific foundation.
- *A paradigm is characterized by a principle;* this supplies the basis for a limited number of concepts, which allow infinitely many methods to be invented, which in their turn help the programmer in solving the problem at hand.
- Early computer technology dates from the era just before World War II in the late 1930s to early 1940s.
- The fourth generation languages are referred to as 4GL. The 4GL's are the shorthand programming languages.

8.10 Keywords

Programming Language: Programming language is an artificial language that can be used to control the behaviour of a machine.

Program: A set of instruction is called program.

8.11 Review Questions

1. Define programming languages
2. Write down the features which force one to learn about programming languages.
3. Briefly describe the history of programming languages and give the hierarchy of programming languags.

4. Describe the category of programming languages briefly.
5. Explain functions used in programming language with example.

Notes

Answers: Self Assessment

1. Programming language
2. Paradigm
3. 4GL
4. Program

8.12 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
2. Ravichandra Rao, (IK): *Library automation.* New Delhi: Wiley Eastern.
3. Rowley, (J.) *The electronic library.* 4th ed. London: LA, 1998.
4. Satyanarayana, (NR): *A manual of computerisation in libraries.*

Online link

http://crypto.stanford.edu/~jcm/books/cpl-sample.pdf
www.nku.edu

Notes

Unit 9: Word Processing Software

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Objectives

After studying this unit, you will be able to:

- Discuss about saving file
- Define formatting the text
- Explain spell checking

Introduction

Notes

Word processors are application software, which are used for word processing. Word processing is the most widely used technique for typing, editing, storing, formatting, manipulating and printing documents with the assistance of computer and printer. It is the most efficient means of generating documents electronically.

Features of Word Processors

Most of the word processing software provides the following useful features:

(*i*) ***Editing of Documents.*** Editing means modifying or making changes in your documents. It would involve:

- Inserting new text
- Copying text from one part of the document to another
- Moving text from once part of the document to another
- Deleting unwanted text.

(*ii*) ***Formatting of documents.*** Each one of us has a hidden desire that the reader should feel interested in whatever we are trying to convey. The formatting features like fonts, bullets and numbering, font type, etc., can be used very intelligently to create the whole impact. A font is a set of letters that have a common or the same type faces. You can apply different font types and sizes in various texts of your document. You can make your text bold, italic and underlined as per your requirements. Your text can be left, right, center aligned or it can be justified within the margins. You can also align the paragraph by specifying left/and right indents along with the desired line spacing. Since adding bullets and numbering to the text makes it easy to read and understand, most word processors provides 'bullets and numbering' feature.

(*iii*) **Page Setting.** Page setting includes putting your text neatly between margins. You can provide different margins for left, right, top and bottom as per your requirements in the document.

(*iv*) ***Tables.*** You can create tables in Windows-based word processors very easily.

Notes Table is simply the arrangement of information in rows and tables.

(*v*) ***Find and replace text.*** In word processing, you can easily find a word of a phrase (group of words) in your documents. Once your word/ phrase is located, you can easily replace it with another word/phrase.

(*vi*) ***Graphics.*** Windows-based word processors (such as MS Word) provides enhanced graphic capabilities, called *clip gallery.* Using clip gallery, you can insert a picture/ diagrammed add multimedia effects such as sound and videos in your documents.

(*Vii*) ***Mail merging.*** One of the most useful features of a word processor is mail merging. It is efficient and faster way of preparing mass mailing to a list of addresses. It is a tool for producing repetitive documents. It gives the flexibility while sending better and then personalising each copy of it with different names and addresses.

Examples of Word Processors

There is a wide range of word processors available for both DOS and Windows environment. Word Star, Softword, Akshar, MS Word, Word Perfect and Amipro are some of the common examples of word processors.

Notes

Word Star, the most common and popular DOS-based word processor, is developed by the MicroPro International Corporation, Inc. U.S.A.. There are different versions of Word Star like 1.x, 2.x, 3.x, 4.0, 5.0, 6.0 and 7.0 but the releases 4.0 (also known as Word Star Professional) was most popular among users during few years back. But now-a-days, after popularity of Windows-based software, Word Star has become obsolete. Softword and Akshar are also DOS-based English and Hindi word processors respectively developed by an Indian Company, Softech.

Among the windows-based word processors, MS Word, Word Perfect and AmiPro are the leaders in the markets. MS Word, developed by Microsoft Inc. is a part of MS Office professional package.

Did u know? Word 97 and Word 2000 are the most popular versions of Word. The latest version of Word is MS Word 2002.

Word Perfect (latest version 6.0), developed by Word Perfect Corporation, which provides almost same features as MS Word is also very popular among users. AmiPro (latest version 3.0)/ Word Pro, developed by Lotus Corporation, is another full-fledged, multi-featured word processor for windows. The important word processors are listed in Table 9.1.

Table 9.1: Important Word Processors

Software	Feature
Word Star	Simplest DOS-based word processor, which is out-dated now.
MS Word	Popular Windows-based word processor from Microsoft.
Softword	Similar to Word Star, developed by an Indian company.
Akshar	Popular Hindi/English word processor developed by an Indian company.
Amipro	Full-fledged, multi-featured Windows-based word processor with DTP features.
Word Perfect	Windows-based word processor with DTP features.

Advantages of Word Processing

Word processing offers several advantages over typewriting. Using the word processing technique, the user can :

- Edit the text as and when required.
- Move or copy any part of the text from one location/ file to another location/ file
- Insert or delete the spaces/text
- Wrap words to the next line *(Word Wrapping)* and justify text to the right margin *(Justification)*
- Select different types of fonts and size of characters
- Adjust the margins and page lengths for the desired output
- Find the required word/group of words and replace with another word/group of words
- Check the spelling of any word of the document
- Store (save) the document on disk and print single or multiple copies
- Print letters with same text and different names and addresses *(mail-merging)*

Besides the above advantages, there are many more benefits of word processing depending upon the word processor used.

9.1 Working with Document in Word 2007

Notes

9.1.1 Creating a Document

Supposing we have to create a document in the form of a letter written to the General Manager of Telephones complaining him of the inflated bills. The text of the letter is shown next. Now that you have opened a new document, do not worry about any typing mistakes or any formatting, just type the text as it is.

11th January, 2007

To,

The General Manager

Mahanagar Telephones Nigam Limited
Khurshid Lal Bhawan
New Delhi - 110 001

Ref: Telephone No. 4611098

Sir,

I am in receipt of bill for the above telephone number dated 11.12.2006 for an amount of Rs. 4,678.90. This bill is to be paid by 21.1.2000. While going through the bill, I notice that I have been charged at two accounts for the calls which have not been made by me. These enteries are:

Called Id	*Duration*	*Amount*
0017249873769	120	1,008.00
0013245934234	60	675.90

As you can notice that both these entries pertain to **International calls** and since my phone does not have this facility, these calls could not have been made from my phone.

I hope that you would look into and send me the revised bill, so that I can make the payment in time.

Hoping for an early action,

Thanking you,

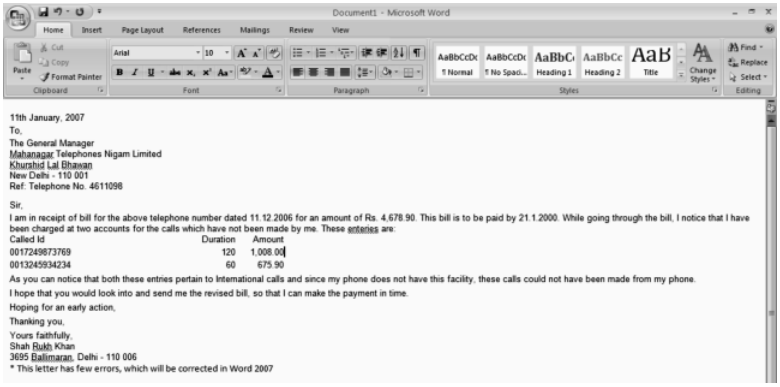
Yours faithfully,

Shah Rukh Khan

3695 Ballimaran, Delhi - 110 006

* This letter has few errors, which will be corrected in Word 2007

Figure 9.1



Notes

As you may notice that there are few red and green wavy lines. The red lines, show that the word is incorrectly typed as per the dictionary available with the system and the word/words under whom the green line is, show that the words are grammatically wrong. This is the opinion of the software, you may beg to differ from it. Since most of the proper names like Shah Rukh Khan, are shown as wrong.

This is just the raw text which has been typed. Now we have to do the formatting. But, before that, lest the file gets tangled in power failure or something, we must save the file.

9.2 Saving the File

It is the process by which you give the name to the file and save under that name. Since our letter pertains to the inflated bill, we will call our file as Bill. For saving, just select the Save option under Office button. You will get the following dialog box. Just type the name Bill in the space provided for typing the filename and click Save. Your file will be saved under this name and automatically the title bar will show the name of the file on the top of the Word 2007 screen.

Now we come to other fomatting tools.

Figure 9.2

9.3 Formatting the Text

Let us now start our formatting from the top. The first line containing address has nothing to be done.

The second line containing To, has to be *italized*.

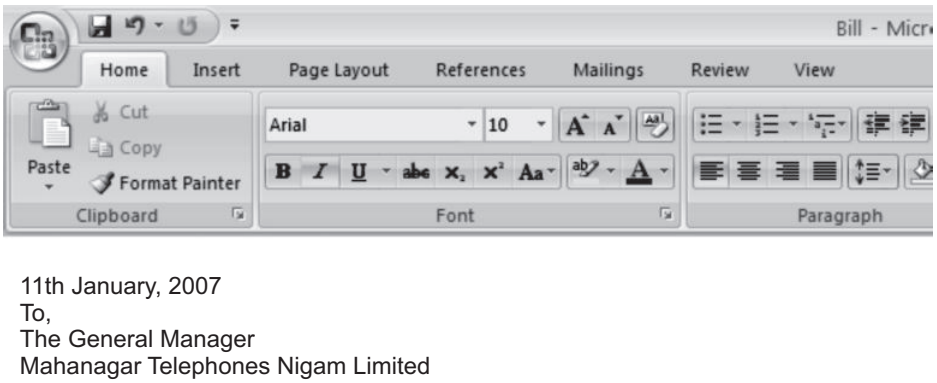
For this do the following:

1. Click the mouse button at the left of T of To.

Notes

2. Now drag the mouse, still having it pressed to the right so that the next character o also gets highlighted. At this stage both T and o are highlighted.
3. Now leave the mouse with To highlighted.
4. With the mouse, click at I in the formatting toolbar to make To as *To*.
5. See how To looks in the next figure.

Figure 9.3



Now we come to the line having The General Manager. This line has to be made bold. This is how we do it.

1. Click the mouse button at the left of T of The General Manager.
2. Since we had highlighted the matter using mouse in the case of To, we will use a different approach here. Press Shift key and start pressing right arrow key ⇨. You will see that as the right arrow key is pressed the matter on the right gets highlighted. So highlight the matter till the point you want it to highlight. In this case highlight till r of Manager.
3. Now leave the shift key.
4. With the mouse, click at B in the formatting toolbar to make the highlighted text as **Bold**.
5. In the figure below, see how the text looks now.

Figure 9.4

Next in the line is the address, whose last line New Delhi - 110 001 has to be underlined. Word 2007 allows you the option of underlining the word with one or more lines. This option is available under Font. But for the time being, we will stick to single underline.

Notes

For this do the following:

1. Click the mouse button at the left of N of New Delhi - 110 001.
2. Using any of the two methods described above, highlight the text to be underlined.
3. With the mouse, click at U in the formatting toolbar to make the highlighted text **Underlined**.
4. You can see the text underlined below.

Coming down now you see the line containing the telephone number. This line has to be underlined and centralized. I am not describing here the method to underline this line since it is similar to the one followed by you in the above case. I am sure you can do it yourself. Let us now concentrate on alignment. Let us see how it is done in Word 2007.

Figure 9.5

9.4 Alignment of Text

Word 2007 gives you the option of placing the text in four different alignments. These are:

Left aligned This line is left aligned.

Right aligned This line is right aligned.

Centralized This line is centrally aligned.

Justified This line has been justified.

You will not notice much of a difference here in left aligned text and justified text. This is so because the matter is small. Just notice the whole text of this book, it is justified, *i.e.*, it aligns to the left and right both. Whereas this particular paragraph is left aligned and see the difference for yourself.

All the four alignments are there on the formatting toolbar. You can choose any one of them. (If you do not have all 4 of them, click at Add and Remove button on the right of the toolbar to add the missing alignment to the formatting toolbar.

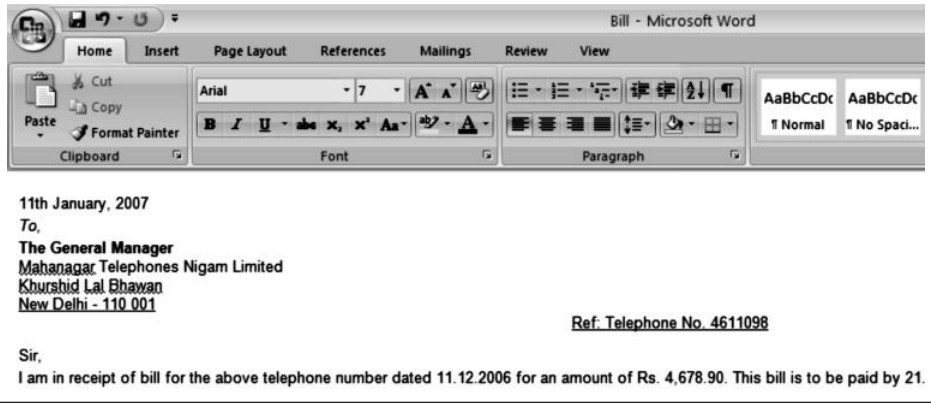
Coming back to our text. We have to centrally align the line containing the telephone number.

For that do the following:

1. Click the mouse button at the left of R of Reference: Telephone No. 4611098.
2. Click at the icon which shows the centralized alignment.
3. Notice here that you do not have to highlight the text for alignment. This is so since the whole matter of the paragraph has to be aligned to the same alignment. It is not possible to align one word to one alignment and another word to another alignment.
4. You can see the text underlined and centralized aligned in the figure on next page.

Notes

Figure 9.6



Now that the next lines have nothing much to be done, expect that International calls and Shah Rukh Khan have to be made bold. This I presume you will be able to do without any difficulty.

It is time to save the document again so as to make sure that the changes made by you are stored in the hard disk.

Next, let us try to put some fancy things on the text. First among them is Font.

9.5 Spell Checking

As was mentioned in the options, Word 2007 points out the spelling errors by underling the word/ words with red wavy line. Since our document is just one page long. It is not difficult to pin point the errors.

There are two methods of correcting these errors. One method is to correct these errors one by one, picking them up. Secondly, you spell check the whole document. Let us do both on our document.

Looking from top to bottom of the text in the document file Bill, you will see few of the words underlined by wavy red line. Few of them are the proper words and thus cannot be corrected.

Words like Mahanagar is basically a *Hindi* word, so it cannot be in the dictionary of Word 2007 and that is why it has been shown as an error. Similar is the case with enteries which is wrong and needs to be corrected. For this follow the following procedure:

1. Click with the mouse at any place within the word to be corrected, in this case enteries.
2. Now right click the mouse button.
3. A pop-menu will pop-up as shown next.
4. Among the various options are:

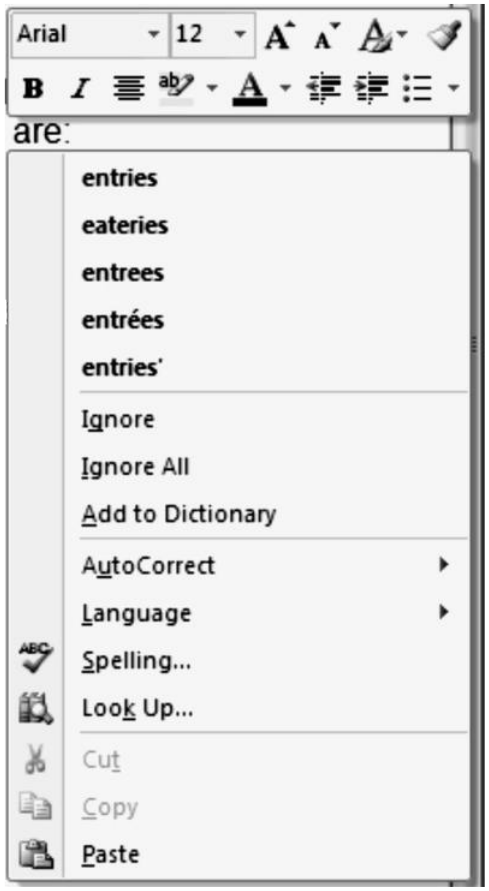
   Alternative Words: Word 2007 displays few words which are similar to the word in question with a hope that these may had been word in your mind while typing this word wrongly. You can choose anyone of them, which you feel is the right word by just clicking and selecting that and leaving the mouse. The word will stand corrected with the new word and will replace the wrong word.

   Ignore: It is like over ruling the dictionary and saying that whatever you have typed is right and would like the dictionary to ignore this not only at this place but also at all other places within the document.

   Ignore All: This will allow you to ignore this error thoughout the document.

Notes

Figure 9.7



Add to Dictionary: You feel that this word is right and would like this word to be added to the dictionary so that it is not shown as an error in the future.

AutoCorrect: You will learn about AutoCorrect later. But, only thing to understand here is that it is a list of mostly misplaced word which can be corrected without referring to the dictionary. For example, you may have the bad habit of typing *the* as *teh*. You can add this to AutoCorrect to correct *teh* to *the* always without even telling you.

Language: You feel that this particular word which has been pointed as wrong by the current dictionary would be available in other language dictionary. So mention here the name of the other dictionary where this word could be found. If you do not have a second dictionary loaded, just ignore this.

Spelling: By clicking at this, you can start the spell checking of the whole document from this point onward.

Look Up: It looks for an alternative word in the Thesaurus.

Cut, Copy and Paste: These can be used for transferring the word to some other place in the document by cutting or copying it at this place and pasting it there.

Notes

5. In our case we will accept entries as the correct substitute for the wrong word enteries.

Since there is no other word which is to be corrected here. The corrected text would now look like the one shown next. Now we come to the second way of spell checking which is checking the whole document. In this case place the cursor at the beginning of the text in the document. In our case we will place the cursor at the left of 1 of 11th January.

From here do either of the following to start the spell checking.

1. Select Spelling and Grammar from the Review Panel.

   Or

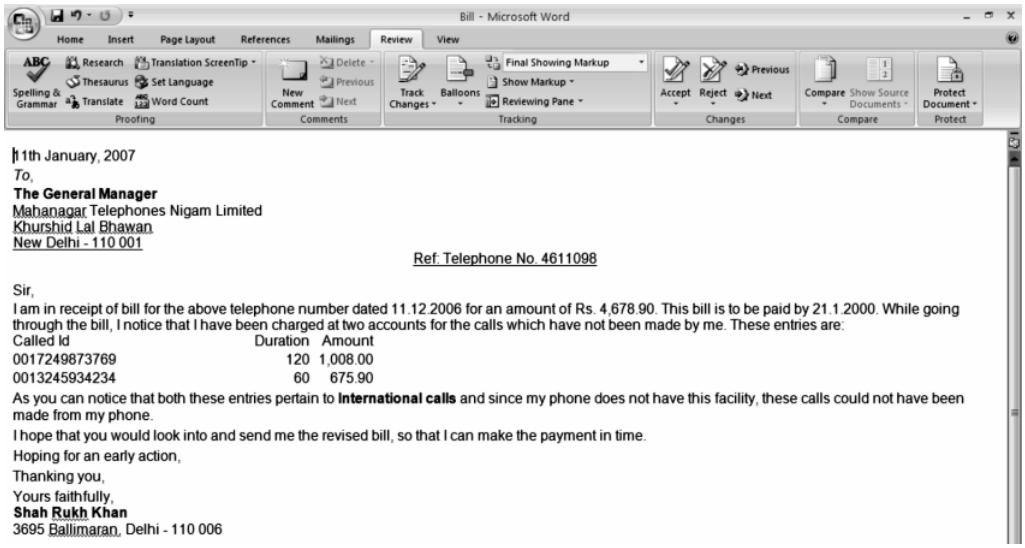
2. Press F7

   Or

3. Click at Spell Grammar in Proofing panel of Review.

This will initiate the spell checking process and will start the spell checking of the document with each word of the document being searched with the similar word with the words available in the dictionary. If not found it will point out.

Figure 9.8



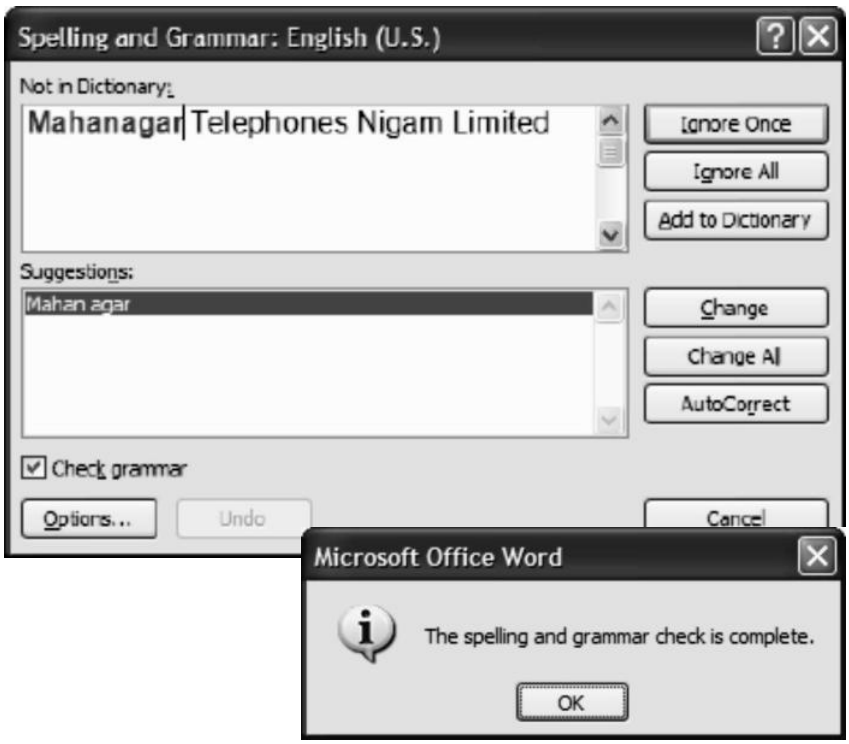
In our case it will select *Mahanagar* of **Mahanagar Telephones Nigam Limited**. As was mentioned before it is a proper *Hindi* word, so it cannot be corrected. Ignore it to proceed further. Other words in the document are also correct. So keep clicking Ignore for all of them till you reach the end of the document and it stops checking the spelling of the document. After this there is no other word to correct and the spell checking ends with a dialog box, saying that the spelling checking is complete.

Remember, you can spell check a portion of the text or a word by just highlighting it and then clicking at Spell Checking Icon.

Then there is another option called Thesaurus.

Notes

Figure 9.9



9.6 Assign Character Styles

Styles are sets of formatting attributes that you can apply to text in your document. Typically styles are applied to whole paragraphs and allow you to use preset formatting for headings, captions, numbered paragraphs, and so forth. However, Character styles are useful when you find yourself using the Format Painter over and over again to apply character formatting.

Character styles add to the current formatting of text. For example, if the text is 12 point Arial italics and your character style applies **bold** and **strikethrough**, the text to which you apply the character style will be 12 point **Arial bold**, *italic*, and ~~*strikethrough*~~.

Assign a Character Style

1. To apply a style to existing text, select the text to which you want to assign the style. If you want to apply a style as your are entering new text, place your insertion point where you want the newly styled text to appear.
2. Choose a style from the Style panel on the Home menu. When you click the Style box, you see each style name displayed in the style's font. An underlined "a" indicates a character style.
3. Click the name of the style you want to use to apply the style to the selected text.

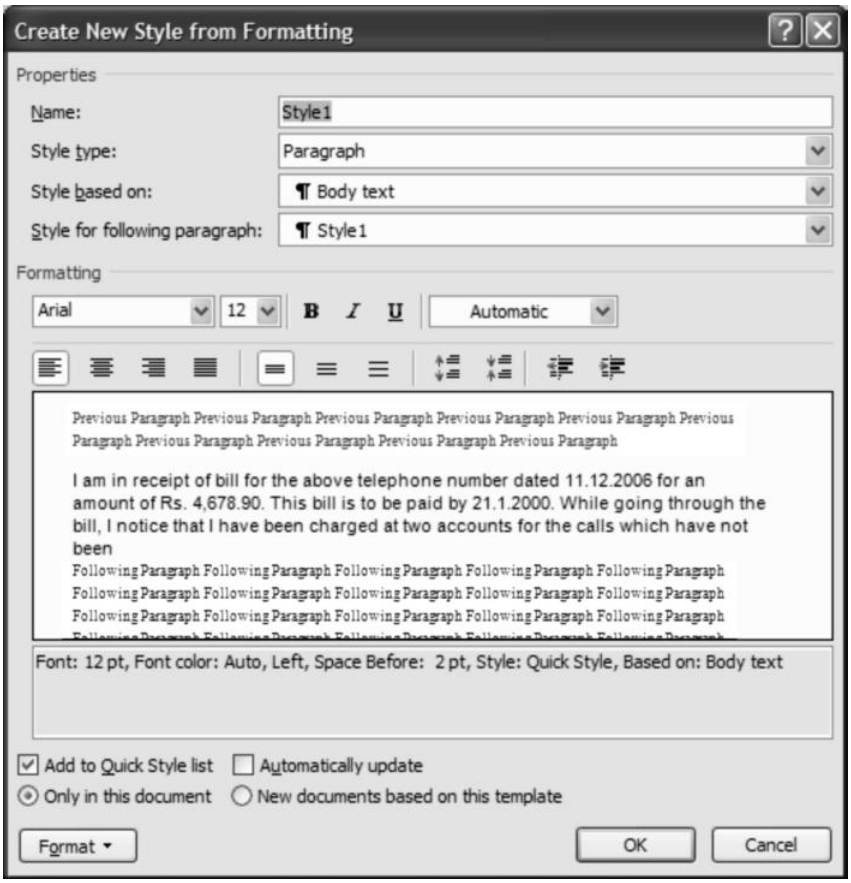
When you want to remove the character style from selected text, apply the character style Default Paragraph Font. The text reverts to the formatting defined in the paragraph style assigned to the paragraph in which the selected text is located.

Notes

Create a Character Style

1. Open the Home panel and choose Styles. Click at the bottom right hand corner.
2. Choose New Style icon at the left hand bottom.
3. This will give you a dialog box, as shown next.
4. Type a name for the new style in the Name box.
5. Choose Paragraph from the Style Type box.
6. Choose Format then Font to set the style's attributes from the Font dialog box. Choose Ok.
7. To add a border or shading to the new character font, choose Format and then Border to open the Borders and Shading dialog box. Make your selections and then choose OK.
8. Choose Ok to close the New Style dialog box.
9. Choose Apply to apply the new style to current text. Choose Close to save the new style definition without assigning it to any text.

Figure 9.10



Creating a character style is easiest when you select text first, apply the font attributes you want in the new style, and then follow steps 1–5 above. You won't have to select any formatting, so skip to steps 7–8 to finish creating the style.

Notes

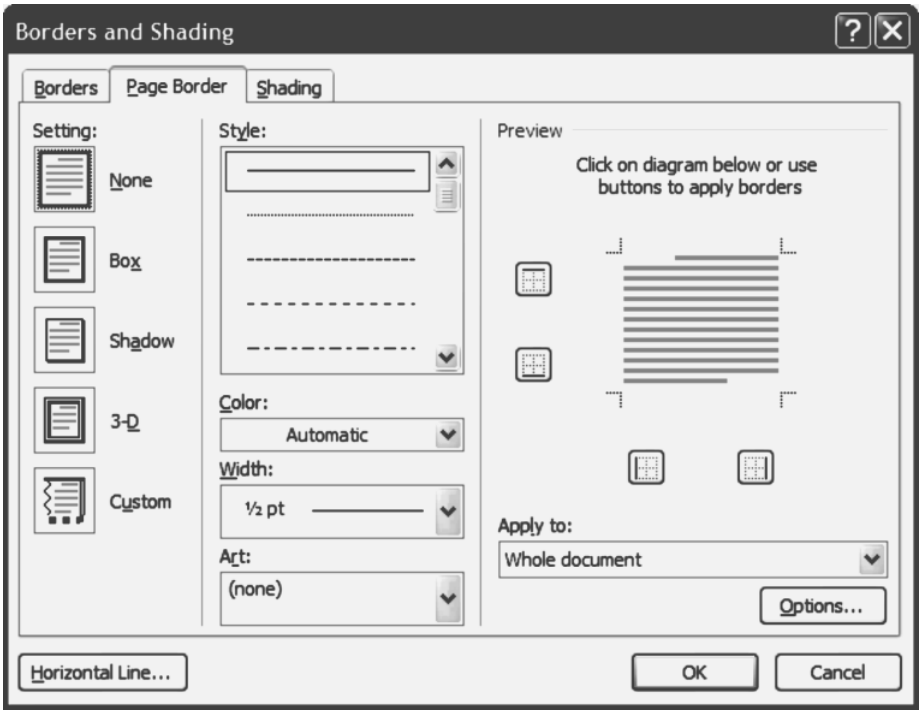
9.7 Borders and Shading

Word 2007 allows you to highlight headlines, captions, and other text of importance by applying a border or shading to that text. You can apply it to a piece of text or to the full text.

Apply Borders and Shading

1. Select the text on which you want to apply Borders or Shading. Basically the rules to follow this are:
   - If no text is selected, the paragraph where the cursor is, will be taken as the starting point.
   - If you select text within a single paragraph, but the paragraph mark itself is not included in the selection, the results affect only the selected text.
   - If you select text included in more than one paragraph (so that at lease one paragraph mark is included in the selection), the results affect all the paragraphs in which any of the selected text resides.
2. Open the Page Layout menu, and select Page Border.
3. Click Borders to work with options available under it.
   - Under Setting, click one of the preset border options.
   - Select None to remove all borders from the selected paragraph(s), Box to insert a box border around the selected paragraph(s), and Shadow to insert a box border around the selected paragraph(s) and apply preset shadow formatting to the border.

Figure 9.11



Notes

- Select 3-D to insert a box border around the selection and apply preset 3D border formatting. Choose Custom to create a border using the options you click in the Preview window. When you choose any of these settings, the current selections in Style, Colour, and Width apply to the borders.
- From the Style list, select the type of line you want to use for the border, including *dotted*, *dashed*, and *wavy lines*.
- Click the Color drop-down list to select a colour to apply to the border.
- From the Width drop-down list, choose the thickness of the border line from ¼ point to 6 points.
- In the Preview box, click the individual border lines or use the border line buttons to apply or remove borders or change the attributes of a particular border (select the attributes first and then add the border).
- From the Apply To drop-down list, select whether to apply the border to just the selected text or to the whole paragraph(s).

4. Select Shading to choose shading options.
   - Under Fill, select the colour or shade of gray with which you want to fill the selection. Click More Colors to see a larger selection of colours.
   - From the Patterns Style drop-down list, choose a shading percentage for the colour you selected under Fill or a pattern of lines such as Lt Horizontal or Dk Trellis.
   - If you selected a pattern of lines, select the Color of the lines from the drop-down list. The Fill colour then becomes the background colour for the pattern.
   - From the Apply To drop-down list select whether to apply the shading options to just the selected text or to the whole paragraph(s).
5. Click Ok.

You can use all these options of Borders and Shading from the Tables and Border toolbar, which can be called from toolbar options.

This will allow you to select shading colours, border line styles, border line colours, and border line widths, etc.

Following are the button on the toolbar that apply to borders and shading.

Table 9.2

Button	Description
Line Style	Sets the style of the border lines (dotted, dashed, wavy, double, and so on)
Line Weight	Sets the thickness of the border lines
Border Color	Sets the colour of the border lines
Borders	Specifies where the border appears (top, bottom, left, right, or box)
Shading Color	Sets the colour of the background shading for the paragraph (you cannot specify the percentage)

Since our letter is a formal one, we would not like to use any of these decorations. They have been told here so that they can be used at a later stage in another document.

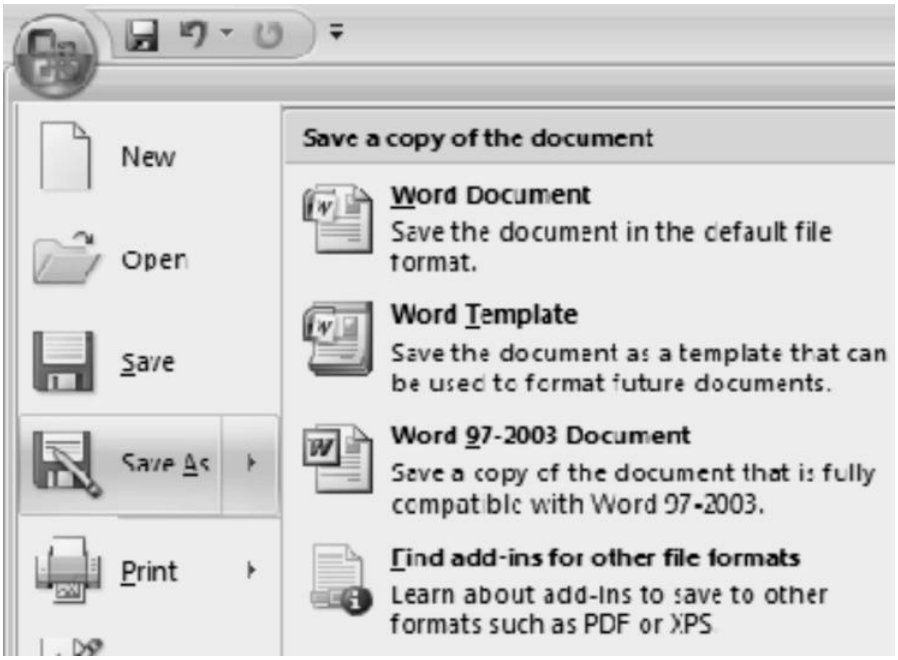
Now that our letter is final. What we would do now is that we will close the file and then reopen and finally print. This is deliberately done so as to learn the concept of closing and opening of the file. If you want you can print the file as it is.

Notes

9.8 Closing of the File

As you would have noticed that there is no Close command in File menu. All you have to do is close the file using the ☒ button on the extreme right top of the word document. But don't forget to save the file before closing else the software will ask you to do so.

Figure 9.12



9.9 Save as Option

Unlike the earlier options of Save As, this time in Word 2007 has different options for Save As. These can be seen here in the dialog box. The options are: Word Document, Word Template, Word 97–2003 Document, Find add-ins for other file formats, and Other Formats. These are self explanatory.

9.10 Editing the Document

Now that you have printed the document, you may want to either correct few words which you have realized that they do not look good in the letter. Even otherwise you may want to enhance the overall look of the letter. Besides this you would also learn how to do the tailor's job, *i.e.*, Cut, Copy and Paste. There are other options too which may not be used in this letter but are quite useful overall for editing. Let us start with the proofing tools.

Editing Tools

Many editing functions are performed on selected text, such as cut, copy, move, and delete. There are various tools provided by Word to help you edit text:

Notes

Cut, Copy: Cutting and copying items places them on the Clipboard and you can paste these items anywhere in the document, wherever required. These items can be text, graphics, tables and any other object which is there in the word document. Cut and Copy can be performed using mouse and key strokes.

Paste: It is the command used to paste whatever is available on the Clipboard to paste it in the document. This is also done by the use of mouse and key strokes.

Move: It is an action associated with the mouse. However, if you cut and paste from one place to another, it can also be called move.

Insert Mode: It is the feature that adjusts spacing when you add new text to the document.

Overtype Mode: This option replaces the existing text with your new text.

Delete: It is an action you should reserve for text you want to permanently remove. Deleted text is not placed in the Clipboard. You can delete text with either mouse or key strokes.

Undo and Redo: Using these commands you can reverse the tasks performed earlier.

All these commands are available on the toolbar in the Home menu.

For either cutting or copying, you have to highlight the part of the text on which you want to perform this operation. All these commands have their keyboard strokes associated with them too. Let us now learn few options of Word 2007 which help us in correcting our document with minimum efforts.

9.11 AutoCorrect

It is a handy feature of Word 2007 which automatically corrects common typing, capitalization, and spelling errors for you, as you type. It also enables you to type shortcuts that AutoCorrect replaces with the full text, such as typing BOMBAY and having AutoCorrect replace it with MUMBAI. This has been neccesiated due to the fact that the name of the city has been changed as thus. Although Word 2007 has a number of default AutoCorrect entries, you can add your own common misspellings and shortcuts.

It only checks whole words, so if you type TEH, Word won't replace it with THE until your press the spacebar, period, or some other key that indicates that the word is complete. It is also useful tool for applying formatting options. In a business letter, for example, you might want your company name to always appear in a certain font and size, regardless of the font you are using for the letter. By creating an AutoCorrect entry of your company name with formatting options, you eliminate the need to format while you type, or to run search and replace when you are finished with the letter.

Add AutoCorrect Entries Without Formatting

1. From the Office button, select Word Options, and then AutoCorrect options.
2. Click Replace Text as You Type to place a check mark there, if it isn't already checked.
3. In the replace box, enter the text you want AutoCorrect to automatically replace for you, such as your initials or a word you commonly misspell.
4. Click Plain Text if it is not selected to inserted text without formatting options.
5. Choose Add. If the text in the Replace box is already listed, choose Replace to replace the existing replacement text with the text you entered in the With box.
6. Click Ok.

Text your new AutoCorrect entry by typing the word in a document and pressing the Spacebar.

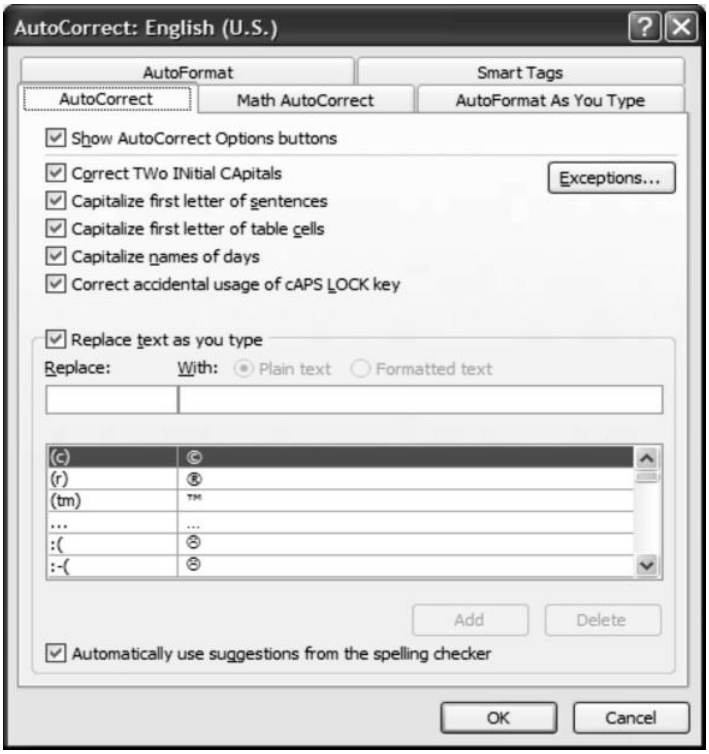
Notes

Add New AutoCorrect Entries with Formatting

1. Type the text in your document and format it.
2. Select the text. To store paragraph formatting with your entry, include the paragraph mark at the end of the text, in your selection.
3. From the Office button, select Word Options and AutoCorrect AutoCorrect. The AutoCorrect dialog box appears.
4. In the Replace text box, type a name for the AutoCorrect entry (an abbreviation, or the entire word or phrase).
5. Click Formatted Text.
6. To save the entry and close the dialog box, click Add.

Here you have an option for Math AutoCorrect tool, which allows you to create mathematical characters, by just writing the english word for it.

Figure 9.13



9.12 AutoFormat

Word 2007 has automated a lot of small, tedious chores that we had to do manually in older word processing programs. Many of these are formatting chores, and Word collects them under the term AutoFormat. You can control what formatting chores Word 2007 performs automatically in the AutoFormat panels of the AutoCorrect dialog box.

Notes

Notes The benefit of using AutoFormat is that you can concentrate more on the content of your document and less on the details of formatting.

AutoFormat works on two different ways—as you type or on command.

AutoFormat as You Type

Automatically formats headings, bulleted and numbered lists, borders, numbers, symbols, and so on, as you type.

AutoFormat on Command

Automatically formats selected text or the entire document in one pass. You don't have to do anything to activate AutoFormat. By default, AutoFormat as You Type is enabled—you just enter text and Word formats it as you go. You can change the default to AutoFormat on Command, which allows you to manually run AutoFormat. This is similar to the way in which you can spell check a document—as you type, or manually, using the menu commands or toolbar icons.

Figure 9.14

AutoFormatting Text

1. To AutoFormat a block of text, select it. To AutoFormat the entire document, make sure that no text is selected.
2. From the Office button, select Word Options followed by Proofing options. From here click at AutoCorrect options to get the dialog box.
3. Click AutoFormat.

Notes

4. Click AutoFormat and Review Each Change if you want the opportunity to accept or reject each change proposed by Word.
5. Choose the type of document you have created in the drop-down list labelled Please Select a Document Type to Help Improve the Formatting Process. This helps Word to AutoFormat the document properly.
6. If you want to limit the types of formatting Word does, choose the Options button to display the AutoFormat panel of the AutoCorrect dialog box. Make your selections and then click Ok to return to the AutoFormat dialog box.
7. Click Ok to begin the AutoFormat process.

Figure 9.15

If you choose AutoFormat Now, Word 2007 formats the document, and that's that. If you choose AutoFormat and Review Each Change, Word 2007 formats the document and then presents a new AutoFormat dialog box. This version of the document looks very different from the first version.

Task Discuss about AutoCorrect and auto formatting.

1. Character styles are useful when you find yourself using the Format Painter over and over again to apply character formatting.
2. Word 2007 allows you to highlight headlines, captions, and other text of importance by applying a border or shading to that text.
3. Save As dialog box has the option to save as: Word Document, Word Template, Word 97-2003 Document, Find add-ins for other file formats, and Other Formats.
4. Editing of the document is done using , Cut, Copy and Paste.
5. AutoCorrect is a handy feature of Word 2007 which automatically corrects common typing, capitalization, and spelling errors for you, as you type.

Self Assessment

Notes

Fill in the blanks:

1. You can start Microsoft Word by using _____ button.
   (a) New (b) Start (c) Program
2. For creating a document, you use _____ command from Office button.
   (a) New (b) Open (c) Document
3. For saving a document, you need to have _____ for it.
   (a) Name (b) Surname
4. For opening an existing document, you need to give _____ command.
   (a) New (b) Open (c) Close
5. You can select the text by:
   (a) Keyboard (b) Mouse (c) Both

State whether the followings sentence are true and false:

6. B in Font is used for making the text Bold.
7. U in Font is used for making the text Underlined.
8. The alignments supported by Word 2007 are: Left, Right, Centre and Upright.
9. Word 2007 allows you to highlight headlines, captions, and other text of importance by applying a border or shading to that text.
10. Editing of the document is done using , Cut, Copy and Paste.

9.13 Summary

- It is the process by which you give the name to the file and save under that name.
- Word 2007 gives you the option of placing the text in four different alignments.
- Word 2007 displays few words which are similar to the word in question with a hope that these may had been word in your mind while typing this word wrongly.
- Word 2007 allows you to highlight headlines, captions, and other text of importance by applying a border or shading to that text.

9.14 Keywords

Spell Checking: Checking spelling errors.

Add to Dictionary: This word is correct you would like this word to the dictionary.

9.15 Review Questions

1. How would you create a document?
2. Which alignments are supported by Word 2007?
3. How are fonts applied to the document?
4. Describe the process of formatting the text.
5. What are character styles?

Notes

6. Which are the borders used by Word 2007?
7. How would you close the file?
8. What is Save As option?
9. How would you print a document?
10. What sort of editing tools are used by Word 2007?
11. What is AutoCorrect?
12. What is AutoFormat?
13. Describe the process of finding a word and replacing it another.
14. How would you put page number on the pages of the document?
15. How are Header and Footer put on the pages of the document?
16. What Footnotes and Endnotes?
17. What is meant by Splitting pane?
18. Describe the process of MailMerge.

Answers: Self Assessment

1. (b)	2. (a)	3. (a)
4. (b)	5. (c)	
6. True	7. True	8. False
9. True	10. True.	

9.16 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
2. Ravichandra Rao, (IK): *Library automation.* New Delhi: Wiley Eastern.
3. Rowley, (J.) *The electronic library.* 4th ed. London: LA, 1998.
4. Satyanarayana, (NR): *A manual of computerisation in libraries.*

Online link

http://www.orbit-computer-solutions.com
http://www1.american.edu
http://www.ehow.com
http://office.microsoft.com

Unit 10: Library Automation

Notes

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10.2 Barriers of Library Automation

10.3 Need of Library Automation

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10.5 Summary

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10.7 Review Questions

10.8 Further Readings

Objectives

After studying this unit, you will be able to:

- Know about the library automation
- Discuss about the barriers of library automation
- Describe the library management system

Introduction

Librarians often referred to ILSs as library automation systems or automated systems in the 1970s and early 1980s. Before the advent of computers, libraries usually used a card catalog to index their holdings. Computers came into use to automate the card catalog, thus the term automation system. Automation of the catalog saves the labor involved in resorting the card catalog, keeping it up-to-date with respect to the collection, etc. Other tasks automated include checking-out and checking-in books, generating statistics and reports, acquisitions and subscriptions, indexing journal articles and linking to them, as well as tracking interlibrary loans.

10.1 Library Automation

Since the late 1980s, windowing systems and multi-tasking have allowed the integration of business functions. Instead of having to open up separate applications, library staff could now use a single application with multiple functional modules.

Notes

As the Internet grew, ILS vendors offered more functionality related to computer networks. As of 2009 major ILS systems offer web-based portals where library users can log in to view their account, renew their books, and authenticate themselves for access to online databases.

In recent years some libraries have turned to major open source ILSs such as Koha and Evergreen. Common reasons noted were to avoid vendor lock in, avoid license fees, and participate in software development. Librarytechnology.org does an annual survey of over 1,500 libraries and noted in 2008 2% of those surveyed used open source ILS, in 2009 the number increased to 8% and in 2010(most recent year available) 12% of the libraries polled had adopted open source ILSs.

Notes Not many years ago, libraries used card catalogs, typewriters, and manually assigned due dates. Library automation, an up-to-date method to help libraries and library patrons to effectively use library resources, is now streamlined because of computers and software.

To appreciate the advantages it becomes necessary to highlight the different levels of library automation. For convenience it can be visualized at four levels:

1. Library cataloging system
2. Housekeeping operations and networking
3. Development of CD-ROM library/products
4. E-mail system and internet.

The library catalogue or index to the collection forms the base for most of the library activities such as acquisition, reference, bibliographic service, inter-library loan etc. The users of library card catalogue will appreciate how fast the retrieval is, search and printing in automated environment. If the same system is available in network environment, users can have simultaneous access to the same database. From the library staff point of view the cumbersome job of printing the cards and their subsequent filing gets eliminated. Also, it conserves space and saves stationary.

The second level automation will be to use software which can handle all the house keeping operations of the library such as acquisition, circulation and serial control thus creating a network within the library or becoming part of the existing network of the institution. Networking of computers within an organization helps the users to browse the cataloguing system from any of the workstation/ terminal.

A very handy technology available for library is the CD-ROM products which can be considered at the third level. The development of CD-ROM collection not only conserves space but also provides multi-user access in network environment. There are many self-tutorial CD-ROMS available with multi-media effect. Libraries facing high incidence of mutilation of materials will benefit from such electronic products. Also people doing empirical research can download data and directly take it to other software platform for analysis and making graphical presentation.

Other technology which libraries can make use of is the e-mail system. This not only reduces the recurring expenditure but also be effective and fast. Sending reminders for non-receipt of journals by e-mail has proved to be very cost-effective. In addition to this, sharing of resources among libraries become easy. Few public domain e-mail software are available and there will be no additional expenditure incurred.

Another technology which has revolutionized the information world is the development of internet. Subscribers of internet, in addition to getting access to various public domain databases and services,

will also get free e-mail and fax facility. Some publishers have started giving content pages of journals and libraries having subscription to such journals can also have full text of the articles. Many academic and research institutes have given free access to their working papers.

Notes

10.2 Barriers of Library Automation

Following could be the few possible barriers of library automation:

- Fear of adverse impact on employment
- Apprehension that the technology could be too expensive
- The library staff has to undergo extensive training.
- Lack of support from the management, may be owing to budget constraints
- Fifth reason could be retrospective conversion of data.

10.3 Need of Library Automation

Library automation is necessary to:

- Obtain increased operational efficiencies,
- Relieve professional staff from clerical chores so that they are available for user-oriented services,
- Improve the quality, speed and effectiveness of services,
- Improve access to remote users and other stakeholders, *e.g.*, the general public,
- Improve access to resources on other networks and systems, including the Web,
- Provide new services not hitherto possible,
- Improve the management of their physical and financial resources,
- Facilitate wider access to information for their clients,
- Facilitate wider dissemination of their information products and services,
- Enable their participation in resource-sharing library networks, and
- Enable rapid communication with other libraries (including outreach libraries) and professional peers.

10.4 Library Management System

- A library management system, also known as an automated library system is software that has been developed to handle basic housekeeping functions of a library.
  - Single function.
  - Integrated.
- Realizing the important role that the library management system will play in planning and implementing library automation projects, it is necessary to educate ourselves and know more about these systems.

Task What do you mean by library management system? Explain it.

Notes

Benefits

Through computer technology and software, library patrons have rapid and more user-friendly access to the latest information. They are also able to remotely access a library's collection.

Efficiency

With RFID chips in books, for example, patrons can check themselves out at a self-serve station, rather than having a librarian do it. Open source software also helps to connect catalogs of separate libraries and offer web-based searches.

Advantages

The Kendriya Vidyalaya Pattom report of India states that advantages to automation include timely access to library materials and providing patrons with research skills.

Control

Library automation makes it easier for a library to know the status of its resources at any given moment. The process also helps to make better use of existing library services and staff.

Skills Building

Marshall Breeding of Vanderbilt University says automation helps librarians to better work with instructors on lesson plans and helps to produce students with information literacy skills

Need and Purpose

As the use of computers and other technologies continue to be used to enhance services provided by a variety of industries, information providers, like libraries, are also automating in-house collections and resources. There are many benefits to automating the information available in libraries, both for the staff and users alike.

Improved Customer Service

Automation of the library helps take some of the workload off of librarians and other staff members in the areas of acquisitions, cataloging and circulation, which in turn allows them to better serve their patrons. This extra time can lead to more programs being facilitated in the library and make library staff available to answer reference questions and help people who having trouble researching or finding the right information.

Cataloging Improvements

Automated cataloging standards, such as MARC (Machine Readable Cataloging), allow for quicker cataloging of library items. Not only does this allow the librarian more time to dedicate to improving customer service, but it also makes the sharing of materials from location to location much easier and much more affordable.

Easier Access

Not only does automation of library materials make it easier to find books, buy it also makes it easier to access journals and some books online from a home computer or elsewhere. The automation of library collections also allows the library to be more flexible when it comes to any increases in demand.

Collections

Automation of the library allows for an improvement in the variety, amount and quality of materials that are available in the library's collection. It can also help make weeding out old, outdated and irrelevant books and materials from the collection, which helps keep the library's collection more streamlined and easier to find the right item.

Notes

Lasting Effects

Automation is also a way of preparing the collection to become sustainable with the ever-increasing shift to a technology-based society, in terms of information dissemination, paired with the ever-decreasing amount of funding for libraries. Automation will help libraries who begin to struggle and are forced to lay off staff. Switching to an automated system allows libraries to add on features when they become available in the future, in stead of having to do a complete overhaul of their collections and cataloging methods.

Did u know? Automation and the networking of academic libraries are still in their formative stages. The reasons for, prerequisites of, and benefits of networking are given. Networking systems at the national and local levels are described, as are the salient features of INFLIBNET, which has been functioning since 1988. There are also three metropolitan networks, viz., DELNET, CALIBNET, and BONET. The libraries of the three metropolitan cities are already reaping the benefits of networking. The constraints of networking in Indian academic libraries are explained. The conclusion is that major information library networks such as INFLIBNET should have a more realistic and time–bound programme.

Automation in Indian Libraries

The scientific and technical libraries working under such R&D institutions as CSIR, ICMR, ICAR, and DRDO have taken the lead in library automation. Notable among public sector libraries are BHEL R&D and SAIL . They have funded several training programs and software development projects which have played an important role in increasing awareness of the potential of the new technologies. Their main emphasis was on database development and information retrieval services. Unfortunately, the academic libraries have made little progress in this direction. The reasons for the slow pace of automation in academic libraries are the following:

- Academic libraries in India function in a relatively less autonomous environment.
- The academic libraries are a comparatively smaller unit within a larger setup.
- Libraries have to compete for scarce resources.
- Undergraduates outnumber postgraduates, faculty, and research staff.
- Academic libraries are not under as much pressure to improve their services as are scientific and technical libraries

Self Assessment

Fill in the blanks:

1. A library management system, also known as an ..... .
2. MARC stands for ..... .
3. In recent years some libraries have turned to major open source ILSs such as Koha and ..... .

10.5 Summary

- Librarians often referred to ILSs as library automation systems or automated systems in the 1970s and early 1980s.

Notes

- Since the late 1980s, windowing systems and multi-tasking have allowed the integration of business functions.
- Automation of the library allows for an improvement in the variety, amount and quality of materials that are available in the library's collection.
- Automation and the networking of academic libraries are still in their formative stages.

10.6 Keywords

Automated Library System: Automated library system is software that has been developed to handle basic housekeeping function of a library.

Library Cataloging System: The library catalogue or index to collection form the base for most of the library activities such as aquisition, reference, bibliographic service, etc.

10.7 Review Questions

1. Explain the barriers of library automation.
2. What is needs of library automation?
3. Write a paragraph on Automation in Indian libraries.

Answers: Self Assessment

1. Automated library system
2. Machine readable cataloging
3. Evergreen

10.8 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
2. Ravichandra Rao, (IK): *Library automation.* New Delhi: Wiley Eastern.
3. Rowley, (J.) *The electronic library.* 4th ed. London: LA, 1998.
4. Satyanarayana, (NR): *A manual of computerisation in libraries.*

Online link

www.freewebs.com/niranjanyuva/Library%20Automation.doc
http://www.softaiminnovations.com

Unit 11: Application of ICT in Different Areas in Libraries

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Objectives

After studying this unit, you will be able to:

- Understand the definition of ICT
- Know about the library services through ICT
- Discuss about the database searching service

Introduction

Libraries in the past used to be temples of knowledge-knowledge generally reserved only for the few. Today, ICT provides a means of reverting this paradigm, not only by providing access to information, but also by disseminating information and fostering interaction. It enlarges the scope of acquisition, processing, organization and dissemination of information and knowledge; it raises speed, reduces cost and overcomes space, time, language and media barriers. The librarians in academic and research institutions have to apply the tools and techniques of ICT to meet the changing requirements of the users by innovating its procedures and systems.

11.1 Definition of ICT

Several definitions have been given to explain and interpret the acronym ICT and the one given below seems to be the closest: 'ICTs is a generic term referring to technologies that are used for collecting, storing, editing and passing on (communicating) information in various forms.'

Notes

Tools of ICT

(1) Computer
(2) Internet
(3) Digital camera
(4) Webcam
(5) Smart Card
(6) Scanner
(7) E-Book
(8) Printer
(9) Electronic Journals
(10) WEB-OPAC
(11) Animation
(12) E-Mail
(13) CDROM.
(14) DVD
(15) RFID Technologies

11.2 ICT Based Library Activities

- ***Data Processing:*** Data processing is any process that uses a computer program to summaries, analyse or otherwise convert data into usable information. The process may be automated and run on a computer.

> *Notes* In the data processing we can do Data Entry, Data Coding, Data Transformation, Data Translation, Data Summarization, Data Aggregation, Data Validation, Data Tabulation, Statistical Analysis, Computer graphics, Data Warehousing, Data Mining.

- ***Circulation:*** A circulation department is one of the key departments of a library. It provides lending services and facilities for return of loaned items. Renewal of materials and payment of fines are also handled at the circulation desk. Circulation staff may provide basic search and reference services, to library users.
- ***Cataloguing:*** Online cataloging has greatly enhanced the usability of catalogs, OPACs have enhanced usability over traditional card formats. The online catalog does not need to be sorted statically; the user can choose author, title, keyword, or systematic order dynamically. Most online catalogs offer a search facility for any word of the title is reached even better.
- ***Bibliography:*** Bibliographic Service Compilation of bibliographies, reading lists and state-of-art reports are very parts of LIS work, particularly in research and academic libraries. Browsing through bibliography database in electronic form on CDROM or online, offers convenient, efficient and cost effective information retrieval. Bibliography databases also provide unique search features such as searching on multiple criteria (key-word, subject, author, source, classification code, year of publication, language etc.), and variety of display formats & styles.
- ***Prepared in House Database:*** A library is a collection of sources, resources, and services, and the structure in which it is housed it is organized by the library for the use of library members.

Notes

Did u know? Modern libraries are increasingly being redefined as places to get unrestricted access to information in many formats and from many sources. In addition to providing materials, they also provide the services of specialists, librarians, who are experts at finding and organizing information and at interpreting information needs.

11.3 Library Services Through ICT

- ***CD Rom Searching:*** The CD-ROMs coming along with books are assigned accession numbers and are kept at the computer section to be issued to the users to get information whenever needed. Library has also subscribed to CD ROM database provides for online Access.
- ***Online Networking:*** Networking is one of the most effective ways of serving users' needs comprehensively. Networked access to databases would help get newly-published information to library users.
- ***Photocopying:*** The technology of reprography made a big impact on the document delivery system. Most of the research libraries have reprographic machines and provide photocopy of any document on demand.
- ***Online Information Service:*** Online Information services are anticipatory or responsive. Both these services promote the use of library materials, make available library materials to users and thus meet user requirements. The various services include Newspaper clippings, Abstracting/Indexing Services, Current awareness services, translation services, referral services, photocopying services and Computerised services.
- ***News Clipping Scanning Service:*** Newspaper Constitute an important source of Information as they contain the latest information in the form of news with, often daily, updating. Print media is useful for research needs but many organization and individuals are turning to online newspaper clipping services and some are organization do this by their library.
- ***Online Reservation Service:*** The Online Reservation Service allows you to reserve books and journals which are on order, being processed by the Library or on loan to another reader. User can place a reservation at the Issue or Information Support Desk using the request option on the on-line catalogue.

11.4 Database Searching Service

Through this service, we regularly provide the users with the exact information they need, depending on their interest profile, from our collection of major national and international databases (retrospective and current) on our subject. The databases are in CD ROM or computerised form which saves their valuable time and energy, as the information available here is pinpointed and readily accessible.

- ***Audio-Visual Service:*** Audio-visual materials are important sources of information, education and entertainment. Many libraries particularly media libraries and large academic and public libraries hold audio visual material such as DVD, films, pictures and photographs etc. Libraries allow their members to borrow these. Recent developments in storage media, compression and encryption technology have made it possible to store large amount of multimedia documents on hard disk and disseminate through internet.
- ***Internet Access:*** The use of the Internet around the world has been growing rapidly over the last decade. Libraries provide free or controlled access to internet and email. Depending upon

Notes

the availability users can be given time slots for use of internet facility. Usually internet enabled terminals are provided in the library that can be used for internet access and email etc.

- E-Query Services: E-Query Service is a Web-enabled contemporary reference service offered to the registered members of the Library together handle queries received in person or by e-Mail. E-Queries may sometimes need to be followed-up with telephone, fax, regular mail, or personal interactions. Library, appropriate and brief information gathered in response will be sent to the enquirer through e-Mail within three consecutive working days from the date of receipt of the query.

Task What do you mean by database searching service? Explain.

Conclusion

Information and Communication Technologies (ICTs) play an important role in enhancing efficiency in development of Library service. ICT is changing the work of libraries and information centers. More than ever, the libraries of India need this technology. An increased number of users, a greater demand for library materials, an increase in the amount of material being published, new electronic formats and sources, and the development of new and cheaper computers are some of the reasons for the growing need for ICT in India. Librarians, library patrons and supporters, and, above all, must help develop ICT-based libraries to meet the changing demands of the users.

Self Assessment

Fill in the blanks:

1. ..... allows you to reserve books and journals which are on order, being processed by the library.
2. Audio-visual materials are important sources of Information, education and ..... .

11.5 Summary

- Data processing is any process that uses a computer program to summaries, analyse or otherwise convert data into usable information. The process may be automated and run on a computer.
- Networking is one of the most effective ways of serving users' needs comprehensively.
- The technology of reprography made a big impact on the document delivery system.
- The use of the internet around the world has peen growing rapidly over the last decade.
- Information and Communication Technologies (ICTs) play an important role in enhancing efficiency in development of Library service.

11.6 Keywords

Data Processing: Data processing is any process that uses a computer program to summaries, analyse or otherwise convert data into usable information.

Online Networking: Networking is one of the most effective ways of serving users' need comprehensively.

Audio-Visual Service: Audio-visual materials are important source of information, education and entertainment.

Notes

11.7 Review Questions

1. What do you mean by data processing?
2. What is the function of CD Rom?
3. Write a note on audio-visual service.
4. Explain the library services through ICT.

Answers: Self Assessment

1. online reservation service 2. entertainment.

11.8 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
2. Ravichandra Rao, (IK): *Library automation.* New Delhi: Wiley Eastern.
3. Rowley, (J.) *The electronic library.* 4th ed. London: LA, 1998.
4. Satyanarayana, (NR): *A manual of computerisation in libraries.*

Online link

http://searchcio-midmarket.techtarget.com/definition/ICT
www.wikipdeia.com

Notes

Unit 12: Online Information Services

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Objectives

After studying this unit, you will be able to:

- Know about the online information services
- Discuss about the search engines and libraries
- Describe the future difficulties for library services

Introduction

Libraries have increasingly become more complementary to the Internet over the years. Currently there are many ways to take advantage of the library services that are offered online in your community. One of the best ways to use these services is to find your local library's online system. You may have to look for the overriding body, such as the nearest larger city or the county in which you live.

12.1 Online Information Services

If this does not work, try contacting your local library. There they can speak to you regarding getting connected with their online system. Perhaps the most useful online library service, for most people, is the ability to see what titles are available to your local library. Most library databases online include abilities to search by title, author, keyword, or directly.

Another powerful aspect of online library systems is the ability to request titles. Chances are that you will come across a book that you would like to check out, but it is not held by your library.

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Generally speaking, most libraries offer a feature online to request that title, and it can be transferred to your local library for you to check out. Such features create a powerful way to enhance your typical library experience. This is quite an advance from previous years, when looking up titles involved locating the appropriate area and seeing if the book is on the shelf.

This creates a special advantage to those that are in any level of school. Students of all levels can now easily pinpoint titles that are needed for research. References are now much easier to locate in one's local library, and relevant titles can be easily transferred for the ease of the student. All of the public can realize the capabilities that are involved in online library services. They can be a great tool for those looking to conduct research or simply find titles to engage interests. Contact your local library or find their website to begin seeing these benefits to online library services.

For a library serving a self-financed higher education institution, such as the College of Professional and Continuing Education (CPCE) Libraries, there have to be tangible needs to justify the provision of new initiatives. The prevailing of electronic resources makes the library collection have more electronic materials than physical items. With students' persistent demand for more electronic books, electronic materials will continue to increase.

All in all, online information services become increasingly important that drives the CPCE Libraries to look into how well its online information services are in meeting the needs of the users and how the services can be improved. Primarily, online information services are provided through the library website which is highly regarded as the services delivery platform and the surrogate librarian-instructor.

Many studies have been done on how the information architecture of the webpage affected information searching. Morville and Rosenfeld defined information architecture as:

- The structural design of shared information environments,
- The combination of organization, labeling, search, and navigation systems within websites and intranets,
- The art and science of shaping information products and experiences to support usability and findability
- An emerging discipline and community of practice focused on bringing principles of design and architecture to the digital landscape.

There are Four Components of the Information Architecture:

The organization systems that govern how the information is categorized, the labeling systems that determine how the information is represented, the navigation systems that facilitate the browsing and moving through the information, and the searching systems that allow searching of the information accessible at the website.

Information Retrieval: Search Engines Boolean Operators

Information Retrieval

Many times, an informal description of the subject of their information seeking goal is the only input they can provide to the digital library. Consequently, keeping in mind that physical access to the underlying digital collection is not an option, efficient subject-based information retrieval is crucial for a successful digital library.

Subject-based information retrieval in the context of digital libraries requires that an adequate number of subject descriptors of sufficient quality should be applied to the underlying information resources. Quantity, together with quality of subject-based indexing, can have an enormous influence on the quality and power of results at the point of actual searching. After all, that which is not indexed cannot be retrieved .

Notes

With this in mind, traditional libraries usually employ LCSHs as a controlled vocabulary that is capable of providing meaningful descriptors for the subjects of their underlying collections. Despite the debate concerning the 'cost-benefit analysis' of creating LCSHs for subject-based indexing of information resources, as stated in Schwartz , 'the application of LCSHs by catalogers has not changed substantially and even some newly-created digital libraries use LCSHs'.

By taking a closer look at LCSHs, a number of significant advantages can be seen that potentially could explain the wide dissemination of LCSHs within OPACs and digital libraries. Thus, as stated in Dean , LCSHs constitute an extensively employed (thus promoting interoperability between library and/or digital library systems), rich vocabulary that covers all subject areas and enjoys strong institutional support from the Library of Congress. Moreover, LCSHs impose synonym and homograph control, as well as have a long and well-documented history.

The semantic quality of LCSHs can be further witnessed when taking into consideration the theory that underpins their application to information resources. Thus, as stated in Bates , proper employment of LCSHs dictates that they are not meant to be single-concept terms.

On the contrary, the resulting subject heading string (being comprised of the main heading plus its subdivisions) is meant to describe all by itself the whole information resource. Consequently, the expressivity of the resulting subject heading string is generally quite broad, often much broader than individual concept index terms. Instead of a few tenths of keywords per information resource used with concept indexing languages, just one or two subject headings are typically applied to an information resource. The types of subdivisions allowed are strictly controlled, as is their order of appearance in the subject heading.

Search Engines

A **web search engine** is designed to search for information on the World Wide Web and FTP servers. The search results are generally presented in a list of results often referred to as SERPS, or "search engine results pages". The information may consist of web pages, images, information and other types of files. Some search engines also mine data available in databases or open directories. Unlike web directories, which are maintained only by human editors, search engines also maintain real-time information by running an algorithm on a web crawler.

12.2 Search Engines and Libraries

Internet Search Engines are a quick and simple way to access information on the World Wide Web. Traditional information providers, such as libraries, have been impacted by the ease with which the public can access information using online search. Search engines provide opportunities for libraries to supplement traditional services, and may also facilitate the development of new services. However, search engines may threaten certain traditional library services, such as reference enquiries,[1] as the use of the internet as an information source becomes increasingly commonplace.

Beneficial Impacts

Supplementing Traditional Library Services

The use of search engines has allowed libraries to augment their traditional core services. Many libraries have developed an effective 'virtual' presence through their websites. This 'virtual' library is available all over the world to anyone who has access to the internet, and presence in a list of search engine results can provide useful publicity for libraries. As part of wider efforts by libraries to embrace new technology, Library Review editor David McMenemy has stated that a library's "Internet identity is vital".

Notes

However, many libraries face challenges in developing effective websites. In the UK administrative procedure means that library websites are contained within the domain of the local authorities that manage them. It has been argued that this compromises the identity of the library and makes it less accessible to its users. Cost is also a considerable factor in the development of effective online libraries.

There is also potential for libraries to make their services more accessible through search engines by making the contents of their catalogues freely searchable. This would assist libraries because results about library holdings would be positioned alongside content from relevant commercial sites, presenting users with the option of borrowing books on their topic of interest instead of purchasing. Library scholars have also acknowledged that people often prefer to access library catalogues using a familiar search engine interface.

Some specialised search engines such as Google Scholar offer libraries a way to facilitate searching for academic resources such as journal articles and research papers. This presents the user with a wider array of resources and establishes a pseudo-network between libraries in dispersed locations. However, the process of improving the accessibility of libraries through search engines has been hampered by proprietary issues over ownership of database records. The Guardian reported on this in 2009, suggesting the necessity for new business models to develop in the library world to harness the full potential of search engines.

Notes Search engines facilitate book lending by providing access to freely available digital book excerpts. This facilitates information seeking by allowing people to preview books and get clear understanding of the subject matter. If they identify an item of interest in this way, their local library may be able to provide a copy, either in a physical or digital format. Libraries would benefit more from this development if the proprietary issues discussed above are resolved. This would allow existing resources such as abstracts, reviews and recommendations that are available on sites such as LibraryThing and Amazon to be linked into items in local library catalogues.

Opportunities for New Library Services

Digitised copies could provide a useful alternative to old or damaged books.

Libraries have opportunities to develop new services and improve library provision using internet search engines. The internet has opened up and transformed the information environment, providing rapid access to high-level knowledge.

This has changed the way that people search for information and libraries are adapting by providing computers and internet access. This development has been particularly positive for libraries in attracting younger users. There are a widerange of reasons why young people often move away from libraries including peer-pressure and social concerns, and the fact that other leisure interests compete with reading for young people's time and attention. However, by providing internet access, libraries are able to offer youth an opportunity to further research their interests such as music, television and sport.

Libraries also have an opportunity to emulate the tools and methods used by internet search engines to attract users. By providing user-friendly interfaces with high speed access to deliver relevant and reliable content, libraries are able to keep up with technological developments and remain relevant to their users. Libraries can take on the 'look-and-feel' of internet search engines but still retain their traditional services. Library scientists have recognised these opportunities to improve their services and complement existing ways to retrieve information.

Projects such as Google Books potentially offer significant new opportunities for libraries. The digitisation of vast numbers of books, particularly those that are out-of-print, has enabled libraries

Notes

to provide resources to their users in new ways. As well as expanding a library's user base to a potentially global scale, this facilitates multiple access to books simultaneously.

Digitised copies of books can also serve as replacements for lost or damaged books and accessibility for disabled users can be improved. Due to their holdings of valuable material, libraries are important partners for search engines such as Google in realising the potential of such projects and have received reciprocal benefits in cases where they have negotiated effectively.

Task Explain the opportunities for new library services.

12.3 Information Literacy and Internet Search Engines

Librarians have often been strong advocates of information literacy. CILIP, the Chartered Institute of Library and Information Professionals in the UK, defines information literacy as "knowing when and why you need information, where to find it, and how to evaluate, use and communicate it in an ethical manner." When utilising a search engine, this involves knowing how to utilise advanced search features as well as select appropriate terms for a search. After results are returned it involves having the ability to select, retrieve, and evaluate the information retrieved by search engines.

Due to the amount of information that is available for free on the internet, search engines carry great potential for making people information rich and decoupling information poverty from economic poverty. However, this is tempered by the amount of poor quality information that exists on the internet. Many in the library profession feel that information literacy is vital if the full potential of the internet is to be realised.

Library advocacy bodies such as CILIP have emphasised the role that libraries and librarians can play in teaching the requisite skills in an environment where information comes in many forms and media. In a 2004 Library Journal article, several library professionals identified the need to know how to get the most out of technologies such as search engines if people are to find reliable and pertinent information effectively.

Information literacy and training in the use of technology fits in with wider extant efforts by public libraries to increase access to information. In accordance with this, CILIP and other library professionals promote the benefits of teaching information literacy in relation to information technology, especially in places such as colleges and universities where students often rely on internet search engines to retrieve information to complete course work.

Did u know? Libraries contribute to information literacy training in colleges and universities by providing online instructions for good search strategies on library homepages or in leaflets made available in the library. Librarians also run information literacy classes to give people practical experience of using internet search engines.

Search Engine Optimisation (SEO)

Opportunities for libraries and librarians have also been identified in the emerging field of search engine optimisation. Search engine optimisation involves improving the volume or quality of traffic to a website without using commercial means such as purchasing keywords from search engine providers.

Notes

The skill set of librarians and their knowledge of information seeking behaviour has led commentators to acknowledge the role that librarians could play as SEO scientists. Librarians have, for their part, acknowledged the necessity of familiarising themselves with SEO in order to promote quality content in search results.

Replacing Traditional Library Services

The task of the library service has always been to provide users with information, traditionally in the form of books, journals, magazines, and newspapers. Internet search engines are also primarily information providers which for many people are just as effective as libraries. This has meant that traditional library services such as book lending and reference services are now under threat from a service many consider to be faster, easier and more convenient.

This situation could be compounded for libraries as technologies improve and search engines become more effective at retrieving relevant information. If people can access information through internet search engines, they no longer feel the need to visit their local library to borrow books, which could result in a decrease in book lending.

Traditional library services also have restricted opening times which may not be convenient for potential users, while internet search engines are available. Furthermore, internet search engines provide information that is not restricted in the amount of time it can be kept for, while traditional library services involve time restrictions on how long a resource can be borrowed, as well as fees to be paid if resources are returned late.

Reference Services

People traditionally visited their local library to use the available reference facility, and ask the reference librarian where to find suitable resources in relation to the information they were seeking. However, internet search engines excel at providing simple factual information; even their detractors acknowledged this in a 2004 symposium in Library Journal on the subject of the information role of Google and other search engines. This often results in decreased use of library reference desks as users gravitate towards new ways of meeting basic information needs.

Undermining Traditional Roles

Traditional library services involve providing a wide collection of books for people to refer to and borrow. However, as the prominence and reliance on internet search engines has grown, library services have often shifted the emphasis from providing a wide range of print resources to providing computers and internet access to facilitate access to information available via search engines. As well as contributing to a decline in book borrowing, some have argued that this trend may also alienate existing users as the library becomes more computer-focused and no longer a quiet place of study.

Libraries face a number of challenges in adapting to new ways of information seeking that often stress convenience over quality. This means that libraries have to adapt if people are going to continue using their services. Information literacy agendas may also suffer as people begin to question its necessity and are willing to accept results that are 'good enough'.

Future Difficulties for Library Services

The ever-increasing reliance on internet search engines could negatively affect libraries and their services in the long-term. The potential decline in library usage, particularly reference services, puts the necessity of these services in doubt. Consequently, libraries may face budget cuts and staff could face job losses. This will likely result in a poorer service which is particularly damaging for libraries at a time when their existence is already being questioned. This has further implications for librarians if their expertise is deemed unnecessary when so much information is easily available online via search engines.

Notes

Library scholars have acknowledged that libraries need to address the ways that they market their services if they are to compete with internet search engines and mitigate the risk of losing users. This includes promoting the information literacy skills training considered vital across the library profession. However, marketing of services has to be adequately supported financially in order to be successful. This can be problematic for library services that are publicly funded and find it difficult to justify diverting tight funds to apparently peripheral areas such as branding and marketing.

Google Books

Google Books presents a number of difficulties for libraries, particularly in terms of copyright and proprietary issues. Writing in The Guardian in 2010, Robert McCrum criticised Google over its digitisation project and highlighted the potential threat such "piracy" poses to both the revenue of the publishing industry and the future quality of information resources.

The monopoly that Google is likely to have if Google Books is successful is a concern for libraries due to its commercial status and has also attracted significant press coverage. In an article for the The New York Review of Books in 2009, Robert Darnton lamented the missed opportunity that libraries had to undertake a similar project which could have fairly compensated copyright holders and would have been driven purely by a concern for the public good.

Other commentators, notably Michael Gorman, have questioned the utility of the entire enterprise. In an 2004 article in the Los Angeles Times, Gorman argued that the mass digitisation of books, particularly scholarly books, is an exercise in futility because a book must be read in full for the real benefits to be felt, and people are unlikely to want to read that much on a screen or print out "500 unbound sheets". Gorman's position provoked significant criticism, particularly from bloggers describing him as a 'Luddite', but he remained unmoved by their arguments in a subsequent response.

Boolean Operators

Boolean Logic, also known as **Boolean algebra**, is a method for describing a set of objects or ideas. It was invented in the 1800s by George Boolean, an English math teacher, but it is has become part of the foundation for controlling computers. The binary **0** and **1** states are naturally related to the **true** and **false** logic variables. By inserting key words, or operators, between terms in a statement you can describe the relationship among the terms.

Boolean Logic

One of the most recent uses of Boolean logic is in search engines. By using the operators AND, OR and NOT you can effectively communicate exactly what you are looking for to the search program. Without a standard language such as this, everyone may have a different way of expressing the same search request. Without this precision, searches would be less than effective, and retrieving valuable information would be even more difficult. The better you know Boolean logic the more effective your searches will be and the quicker you will be able to find what you are looking for.

Use of Boolean Logic

The most practical places for you to use Boolean logic are in search engines. An engine is a search program located on a powerful computer. The engine allows you to search its database of the Internet. The following are links to engines that allow users to use Boolean logic. There are many more engines that allow Boolean but these are generally regarded as the best. If you have any doubts, you can check the engine's help section to learn specific syntax required for queries.

Notes

- ***AltaVista:*** A fast and powerful engine with advanced Boolean capabilities. Its database (full text of Websites) is best when looking for hard-to-find information (www and usenet).
- ***HotBot:*** A powerful search engine that allows basic Boolean features. It also provides a pleasing user interface (www and usenet).
- ***OpenText:*** Another powerful search engine with a full set of Boolean operators. Its strength is the ease of searching its full text database of the Web (www only).
- ***Lycos:*** One of the search engine pioneers since 1994. It provides good listings of search results, and allows users to search more than just the Web (www, FTP, Gopher).

Self Assessment

Fill in the blanks:

1. Boolean logic is also known as ..... .
2. Boolean operators was invanted in the 1800s by ..... .
3. Libraries have opportunity to develop new services and improve library provision using ..... .

12.4 Summary

- Libraries have increasingly become more complementary to the Internet over the years. Currently there are many ways to take advantage of the library services that are offered online in your community.
- Most library databases online include abilities to search by title, author, keyword, or directly.
- Internet Search Engines are a quick and simple way to access information on the World Wide Web.
- The use of search engines has allowed libraries to augment their traditional core services. Many libraries have developed an effective 'virtual' presence through their websites.
- Libraries have opportunities to develop new services and improve library provision using internet search engines.
- Google Books presents a number of difficulties for libraries, particularly in terms of copyright and proprietary issues.
- **Boolean logic**, also known as **Boolean algebra**, is a method for describing a set of objects or ideas.
- One of the most recent uses of Boolean logic is in search engines. By using the operators AND, OR and NOT you can effectively communicate exactly what you are looking for to the search program.

12.5 Keywords

Google Books: Google Books presents a number of difficulties for libraries, particularly in term of copyright and proprietary issues.

Boolean Operation: Boolean logic, also known as Boolean algebra, is a method for describing a set of objects or ideas.

AltaVista: A fast and powerful engine will advanced Boolean capabilities.

Notes

12.6 Review Questions

1. What do you mean information literacy and internet search engines?
2. What is future difficulties for library services?
3. Write a note on Google Books.
4. What is Boolean logic? Explain the uses of Boolean logic.

Answers: Self Assessment

1. Boolean algebra
2. George Boolean
3. Internet search engines

12.7 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
2. Ravichandra Rao, (IK): *Library automation.* New Delhi: Wiley Eastern.
3. Rowley, (J.) *The electronic library.* 4th ed. London: LA, 1998.
4. Satyanarayana, (NR): *A manual of computerisation in libraries.*

Online link

http://realestate.about.com/od/sv/g/defsearcheng.htm
http://www.cenlib.iitm.ac.in/docs/library/index.php?page=infolit]
http://www.openclinical.org/informationretrieval.html

Unit 13: Library Software

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13.4 Library Software: Essential Features

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Objectives

After studying this unit, you will be able to:

- Know about the classification of software
- Discuss about the operating systems
- Describe the uses of language translators
- Understand essential features of library software

Introduction

Software is a program or set of instructions, which is required to use the computer. Many types of software are available for various applications. The software development field is so advanced that day by day existing software are becoming outdated and new software are coming in the market. So, we must get aware of the latest developments in the software industry.

Notes

13.1 Classification of Software

Software are broadly classified into the following two types:

(*a*) System Software

(*b*) Application Software

Let us discuss these.

System Software

Software that are required to control the working of hardware and aid in effective execution of a general user's applications are called System Software. These software perform a variety of functions like file editing, storage management, resource accounting, I/O management, database management, etc. Some of the examples of system software are DOS (Disk Operating System), Windows, BASIC, COBOL and PC TOOLS. These software are developed by System Programmers. System software can be further categorised into the following three types:

(*i*) ***System Management Software.*** These software are used to manage the computer hardware and are essential to use the computer. They include operating systems and operating environments such as DOS, Windows, UNIX, etc.

(*ii*) ***System Development Software.*** These software are used for development of both system and application software. They include Language Translators, Application Generators, CASE Tools, etc.

(*iii*) ***System Software Utilities.*** These software support the operation of the computer by providing file management capabilities, data compression, diagnostic routines, virus detection and removal, text editing, etc.

Application Software

Software that are required for general and special purpose applications like database management, word processing, accounting, etc. are called Application Software. Some of the examples of application software are dBASE, Word Star, Tally, etc. Application software are developed using system software by Application Programmers. Application software can be further classified into the following two types:

(*i*) ***General Purpose Application Software.*** Whenever an organisation purchases computers, besides an operating system certain application software are also required to be purchased. These software are needed for general purposes like word processing, database management, spreadsheets etc. and are known as General Purposes Application Software. For example, Database Management Packages, Word Processors, Spreadsheets, etc. are general purpose application software.

(*ii*) ***Special Purpose Application Software.*** Although general purpose application software are exclusively used by all users for general applications, there are certain software which are meant for some special applications and organisations. Besides general purpose application software, some organisations also need software for desktop publishing, graphics, multimedia, animations, financial accounting, sales and marketing, inventory, export documentation, etc. These software are collectively known as Special Purpose Application Software. For example, software required for Desk Top Publishing, Graphics, Multimedia, Accounting, Inventory, Production Management, etc. are special purpose application software.

13.2 Operating Systems

An operating system is the most essential system software that manages the operation of a computer. Without an operating system, it is not possible to use the computer. The computer is useless unless

it is provided an essential software that makes it ready to use. An operating system is software, which makes the computer ready to use by a process called *booting*.

Notes

Types of Operating Systems

Many operating systems are available for computers which can be divided into the two types : (*i*) Single-user operating systems, and (*ii*) Multi-user operating systems.

(*i*) ***Single-user Operating Systems.*** These operating systems are used for mainly computers having only one terminal (stand-alone PCs). MS DOS (Microsoft Disk Operating System) and PC DOS (Personal Computer Disk Operating System) are the two important single-user operating systems. Both systems are almost identical and are simply called *DOS.*

(*ii*) ***Multi-user Operating Systems.*** These operating systems are used for those computers (micro to mainframe) which have many terminals (multi-user systems). The popular operating systems used for multi-user systems are UNIX, NETWARE, MVS, OS/400, VMS and Linux. OS/2 and Windows NT are other popular multi-user, multi-tasking operating systems for microcomputers.

13.3 Language Translators

We give instructions to computer using a language. A set of instructions is called a *Program* and the language using which we give the instructions is called the *Programming Language* or *Computer Language* or simply *Language.* There are many types of computer languages such as Machine Language, High Level Languages, etc. Although we can give instructions to computer using any language, internally it understands only the machine language. The machine language consists of two numbers only *i.e.,* 0s and 1s. Regardless of the programming language used (except machine language), the symbolic instructions have to be translated into a form, that can be executed by computer. The software, which converts the codes of other languages into machine code, are collectively called Language Translators.

Language Translators are categorised into the following three types :

(*a*) Interpreters

(*b*) Compilers

(*c*) Assemblers

Interpreters

Instructions of a high-level language are coded in many statements. At the time of their execution, they are converted statement by statement into machine code, by using system software, called Interpreters. For example, programs written in BASIC language are executed by using BASICA or GWBASIC interpreters. Programs written in some fourth generation languages, like dBASE III plus are also executed using dBASE interpreter. There are certain disadvantages of interpreters. As instructions are translated and executed simultaneously using interpreters, interpreters are very slow for executing large programs. Hence, they are not suitable for the most of applications development.

Compilers

As contrast to interpreters, compilers provide faster execution speed. Compilers do not translate and execute the instructions at the same time. They translate the entire program (source code) into machine code (object code). Using linker, the object code is converted into executable code. Compilers are widely used in translating codes of high level languages (*e.g.,* COBOL, FORTRAN, Pascal, Turbo/ Quick BASIC, Turbo/ Microsoft C etc.) and fourth generation languages (dBASE IV, Foxpro, etc.). As compared to interpreters or assemblers, compilers are preferred in development of application software.

Notes

Assemblers

Assemblers translate the assembly language code (source program) into machine language code (object program). After assembling, a linker program is used to convert the object program into an executable program. The Microsoft Assembler program (MASM) and Borland Turbo Assembler program (TASM) are two popular assemblers. Assemblers are used mainly in the development of system software.

Task What do you mean by language translators? Explain the different types of language translators.

13.4 Library Software: Essential Features

Choosing the best solution for library is about selecting the right software and the right technology partner. To streamline and make the process less difficult, library management software package was introduced. Right here, we is going to be discussing about this software and managing the library facts.

A extremely crucial thing that's should in every library is really a method that saves precious studying time in the visitors. This really is facilitated by speedily guiding the reader towards the book he wants. And this information and facts should not be restricted to just publications but have to extend to all of the studying supplies. These may be anything from journals, dissertations, undertaking reviews, thesis, maps, articles, charts, DVDs, CDs, audio cassettes, scanned pictures, e-journals, video clip cassettes, audio and video files and every other type that's there in the library.

A few of the points that ought to be present in an excellent library to make it purpose efficiently are detailed beneath:

Bar Code

A library ought to have software which can be able to read bar codes. Without this computer software, the library can't be known as automated. The bar code studying software programme assists in trying to keep track of all of the guides that are coming in or going out. Most of the library software programme does not have this feature. One has to thus check before obtaining the computer software that it has this function.

Multimedia Management

The modern libraries, unlike typical types, have several educational supplies aside from guides like CDs, audios, DVDs and video cassettes. As a result, it can be vital that the library has management programs that contain all these as well.

Printing Applications

The software must facilitate printing of member I-cards and sustaining the borrowing historical past of every single member. It need to also keep track of the textbooks issued and returned by every single member.

Technical Help

The software programme have to be accompanied using the technical help solutions. That is significant because the software package could run into difficulty anytime. This usually means that a whole lot of time will likely be wasted as well as the entire functioning from the library are going to be hampered.

Notes

Notes In case of technical assistance help, the difficulty could be solved swiftly, thereby making certain the smooth running of the library.

Compatibility

The software programme becoming utilised in the library need to be suitable with all other software package like Microsoft Workplace, SQL which stands for Structured query language and DBMS. People can very easily get this application on line. There are numerous internet sites supplying this software programme. has to just surf the internet for these internet websites. You'll be able to also research for computer software that has all these functions. Just ensure which you buy it from an authentic web page. Otherwise, you might not get technical help.

13.5 Development of Library Software Packages

Design and development activity of library software packages in India started in a big way during mideighties with the introduction of CDS/ISIS software package o f UNESCO in Indian libraries by the National Information System on Science and Technology (NISSAT), New Delhi. NISSAT organised a number of short term training courses on applications of CDS/ISIS on library and information activities to make senior professionals aware of the benefits of computerisation in libraries, to train library staff to make it operational in the libraries and to develop computer culture among the librarians and information scientists From the experience of use of CDS/ISIS, MINISIS, etc., some of the libraries and information centres dcveloped/got developed their own software, such as DESIDOC developed Defence Library Management System (DELMS) during 1988 in COBOL language under multiuser Unix environment and implemented it at Defence Science Library (DSL) in DESIDOC. Also Catman was developed by the lndian National Scientific Documentation Centre (INSDOC), New Delhi and implemented at National Science Library (NSL) in INSDOC. Sanjay package was developed for small libraries by DESIDOC under NISSAT project to popularise COS/ISIS and to develop a model automated library by implementing it at Technology Bhawan Library in DST, New Delhi, etc. Now, libraries are fully aware about the needs of computerisation and many software packages are available for their use depending upon the needs. However, selection of a suitable software for library is a problem because of lack of good, and uptodate comparative studies on software packages. Thus, some attempts have been made here to evaluate some of the software packages used in Indian libraries and information centres based on published literature, demonstration in conferences. practical experience, personal discussions, etc.

Library Software Packages in Indian Libraries

Besides CDS/ISIS, Minisis, etc., a number of library software packages have been designed and developed indigenously and these are being used in various Indian libraries and information centres. Some of the library software packages are given in Table 13.1.

Table 13.1: Some Library Software Packages and their Developing Agencies

No.	Software Package	Developing Agency
1.	Archieves	Microfax Electronici Systems, Bombay
2.	Acquas	Ober Information System, Calcutta

Notes

3.	Catman	INSDOC, New Delhi
4.	Defence Library Management System	DESIDOC, New Delhi
5.	Golden Libra	Golden Age Software Technologies, Bombay
6.	Granthalaya	INSDOC, New Delhi
7.	Krvger Library Manager	Blitz Audio Visuals, Pune
8.	Libman	Datapro Consultancy Services, Pune
9.	Libra	Ivy System Ltd., New Delhi
10.	Librarian	Soft-Aid, Pune
11.	Library Management	Raychan Sysmatics, Bangalore
12.	Library Manager	System Data Control Pvt Ltd., Bombay
13.	Libris	Frontier Information Technologies Pvt. Ltd., Secunderabed
14.	Lib Soft	ET & Corpon., New Delhi
15.	Libsys, Micro-Libsys	Libsys Corpn. New Delhi
16.	List Plus	Computer Systems, Bangalore
17.	Loan Soft	Computek Computer Systems, Hyderabad
18.	Maitrayee	CMC, Calcutta (for the CALIBNET Project)
19.	MECSYS	MECON, Ranchi
20.	NILIS	Asmita Consultants, Bombay
21.	Nirmals	Nirmal Institute of Computer
22.	Salim	Expertise, Tiruchirapalli, Uptron India Ltd., New Delhi
23.	Sanjay	DESIDOC, Delhi (Under a NISSAT Project)
24.	Slim 1.1	Algorythms, Bombay
25.	Suchika	DESIDOC, Delhi.
26.	Trishna	NISTADS, New Delhi. (Under NISSAT Project)
27.	Tulib	Tata Unisys Ltd., Bombay
28.	Ulysis	WIPRO Information Technology Ltd., Secunderabad
29.	Wilisys	Wipro India, Bangalore

13.6 Library Software Features in India

Library Software has been designed to automate and manage all types of libraries. Library Software is capable of managing Issues, Returns, Magazine/Newspaper Subscriptions, Fine and Balances of payments due from Members, Cataloguing, OPAC /powerful web based search facility, various reports for record-keeping and review purposes, according to end user requirements.

Moreover this software is fully compatible with Bar Code based management. Use of Bar Codes for Library Management eases the everyday tasks of big Libraries, where the number of transactions

Notes

exceed several thousands in number. Moreover, the software can work even without Bar Codes seamlessly. The Bar-Code generation and printing process is a Built-In feature of this Software.

We also offer customised library software as per clients requirement. We have installed library software at Delhi High Court Library, Supreme Court Library, All India Radio Library, Indian Navy Library, Ved Vyasa School Library and many other libraries.

Key features of the Software are listed below:

Book and Member Record management with the help of Bar-Codes (Optional)

Customizable grouping of members under various Categories and Classes

Customizable Fine Settings for various Categories of Members (Fine per day/Book return Period etc.

Membership Subscription Period management (Optional)

Member's Fine Balance management facility.

Powerful Search Facility for Book and Member Search based on various Search Criteria

Barring of Book Issues to Book and/or Fine Defaulters (Optional)

Comprehensive Fields for Books and Member's Record to suit all requirements

Magazine/Newspaper Subscription management facility

Multiple Library Location setup feature

Complete management of records of Book-Donor, Vendor, Publisher, Author, Locations, Subjects, Categories, Designations/Classes, Rack-Shelf etc.

Book-Reservation facility (Optional)

Comprehensive Reports:

Book Issues/Returned/Due etc

Books Purchased

Books Recd. in Donation

Books in Default

Members Fine Report

Fine balances of Members

Payments Recd by Members

Authors

Publishers

Vendors

Book Donors

Subjects

Categories

Members Categories and Rules

Complete Book Catalog

Books Purchased

List of Holidays

Database Backup and Restore facility

Intuitive Design for ease in operation

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Bar Code Printing Facility for Books and Members

Customizable Security and Access Levels

Supports Unicode

Self Assessment

Fill in the blanks:

1. Software that are required to control the working of hardware and aid effective execution of a general user's applications are called ..... .
2. Software that are required for general and special purpose application like database management, word processing, accounting, etc., are called ..... .
3. A set of instructions is called a ..... .

13.7 Summary

- An operating system is the most essential system software that manages the operation of a computer.
- We give instructions to computer using a language. A set of instructions is called a *Program* and the language using which we give the instructions is called the *Programming Language* or *Computer Language* or simply *Language.*
- Instructions of a high-level language are coded in many statements. At the time of their execution, they are converted statement by statement into machine code, by using system software, called Interpreters.
- A library ought to have software which can be able to read bar codes. Without this computer software, the library can't be known as automated.
- The software programme have to be accompanied using the technical help solutions. That is significant because the software package could run into difficulty anytime.

13.8 Keywords

System Software: Software that are required to control the working of hardware and aid in effective execution of a general user's application.

Application Software: Software that are required for general and special purpose application like database management, word processing etc.

Single-user Operating System: These operating systems are used for mainly computers having only one terminal.

13.9 Review Questions

1. What is system software? Explain the different types of system software.
2. Define the operating system.
3. Write a note on bar code.
4. What is the features of library software in India?

Notes

Answers: Self Assessment

1. system software
2. application software
3. program

13.10 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
2. Ravichandra Rao, (IK): *Library automation.* New Delhi: Wiley Eastern.
3. Rowley, (J.) *The electronic library.* 4th ed. London: LA, 1998.
4. Satyanarayana, (NR): *A manual of computerisation in libraries.*

Online link

http://factoidz.com

http://www.wisegeek.com/what-is-an-operating-system.htm

Notes

Unit 14: Selected Library Packages: Winisis, Libsys, Soul, Koha

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14.1 WINISIS

14.2 LibSys

14.3 Soul

14.4 Koha

14.5 Summary

14.6 Keywords

14.7 Review Questions

14.8 Further Readings

Objectives

After studying this unit, you will be able to:

- Know about the Library packages-WINISIS, LIBSYS, SOUL, KOHA

Introduction

The ISIS for Windows (WINISIS) plays an important role for automation of library operations in developing countries like India because of its easy-to-use features, convenient availability, negligible cost of implementation, continuous development and support from UNESCO, and a large user community. Recent developments in WINISIS, such as web-enabled interface, tools for data conversions into bibliographic standards and handling of digital documents, have made it a potential tool for development and management of digital libraries.

14.1 WINISIS

The major features of the CDS/ISIS software are:

- The handling of variable length records, fields and sub fields, thus saving disk space and making it possible to store greater amounts of information;
- The handling of repeatable fields;

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- A data base definition component allowing the user to define the data to be processed for a particular application;
- A data entry component for entering and modifying data through user-created data base specific worksheets;
- An information retrieval component using a powerful search language providing for field-level and proximity search operators, in addition to the traditional and/or/not operators, as well as free-text searching;
- A powerful sort and report generation facility allowing the user to easily create any desired printed products, such as catalogues, indexes, directories, etc.;
- A data interchange function based on the ISO 2709 international standard used by leading data base producers;
- An integrated application programming language (CDS/ISIS Pascal and the ISIS_DLL), allowing the user to tailor the software to specific needs;
- Functions allowing the user to build relational data bases, though CDS/ISIS is not based over a relational model;
- Powerful hypertext functions allow to design complex user interfaces.

A Windows interface between CDS/ISIS and IDAMS, the UNESCO software for statistical analysis, has also been developed.

From the outset, CDS/ISIS was created as a multi-lingual software, providing integrated facilities for the development of local linguistic versions. Thus, although UNESCO distributes only the English, French and Spanish versions of the package, user-developed versions exist in virtually all languages, including special versions which UNESCO helped in developing, for Arabic, Chinese and Korean.

Did u know? Due to fast expansion of higher education in India in the recent years, a large number of new and established institutions are embarking upon implementation of ICT for provision of library and information services. There is also increasing interest among information professionals to use open source information processing tools, such as WINISIS, Greenstone, DSpace, EPrint, etc. However, limited training opportunities in non-metropolis are an impediment to the spread of these tools.

WINSIS network configuration example with window NT4

1. **Principles and définitions**

A network is composed by a Server and n local PCs.

Local PCs : Server's hard disk portion that can be accessed from local PCs (read-only) is a network drive indicated by the letter <H:>. This may correspond for example, to the partition <D:> of the Servers' HD.

Local PCs may, of cours, read and write their own HD's <C:\WINISIS\> folder and its subdirectories.

Following the experience accumulated with the Dos version of CDS/ISIS, it is suggested that folders and files in PROG, MENU, MSG and WORK to be accessible for writing. (Better to foresee a backup copy of these files on local machines)

A distinct working directory on each local client PC is also needed for multi-user operations. These directories shall have the same name (*i.e.* C:\work).

Notes

At program start from a local PC, a dialog box for choosing the configuration could also be foreseen (Syspar.par parameter zero). This will lead accesses to Server's data or local data depending on the need or authorization.

2. **Installation on local PCs**

```
C:\WINISIS
        |__BG
        |__MENU
        |__MSG
        |__PROG
        |__WORK
        |__DATA
                |__DBN1
                |__…..
                |
```

The root folder C:\winisis\ of the local PC will also contain the file

SYSPAR.PAR mainly including:

```
1=C:\WINISIS\PROG\
2=C:\WINISIS\MENU\
3=C:\WINISIS\MSG\
4=C:\WINISIS\WORK\
101=FR
141=C:\WINISIS\BG\
0=?Type LOCAL ou NET
……————————————————
```

In the C:\WINISIS\DATA\ folder on the local machine, are the DBNi.PAR files. Each file contains 10 parameters as follows:

DBN1.PAR:

```
1=C:\WINISIS\DATA\DBN1\
2=C:\WINISIS\DATA\DBN1\
3=C:\WINISIS\DATA\DBN1\
4=C:\WINISIS\DATA\DBN1\
5=C:\WINISIS\DATA\DBN1\
6=C:\WINISIS\DATA\DBN1\
7=C:\WINISIS\DATA\DBN1\
8=C:\WINISIS\DATA\DBN1\
9=C:\WINISIS\DATA\DBN1\
10=C:\WINISIS\DATA\DBN1\
```

Notes

Create in C:\WINISIS\ the following two configuration files:

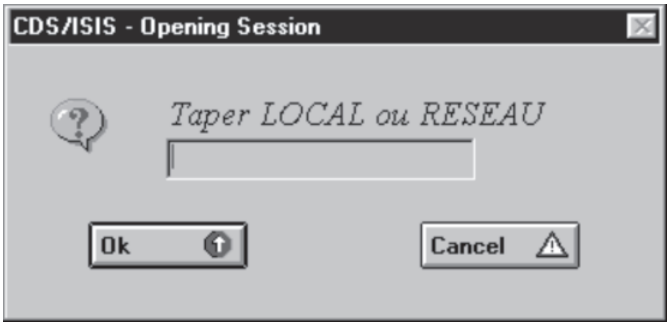
LOCAL.PAR	NET.PAR
5=C:\WINISIS\DATA\	5=H:\WINISIS\DATA\
14=1	14=1
	102=SH

Note:

102=SH selects the search only menu interface, preventing PC's users from modifying the Server's data. Winisis' menus and windows will only allow search and printing.

When running Winisis on local PCs, the following screen will appear :

Figure 14.1



Using the LOCAL on NET access will give access to DBNi located on the PC or to the network data bases Basei located on the Server, respectively (ex: CDS ci-après).

3. **SERVER installation**

The Basei database (for example CDS) will be placed on the Server as follows:

```
D:\WINISIS

        |__DATA
        |      |__CDS
        |      |__.....
        |      |__.....
```

The Basei.PAR (ex: CDS.PAR) files containing information on the Server's data bases, will have to be located in the Server directory D:\WINISIS\DATA, but they will be used from the client machines. For example:

CDS.PAR:

1=H:\WINISIS\DATA\CDS\

2=H:\WINISIS\DATA\CDS\

3=H:\WINISIS\DATA\CDS\

4=H:\WINISIS\DATA\CDS\

5=H:\WINISIS\DATA\CDS\

Notes

6=H:\WINISIS\DATA\CDS\
7=H:\WINISIS\DATA\CDS\
8=H:\WINISIS\DATA\CDS\
9=H:\WINISIS\DATA\CDS\
10=H:\WINISIS\DATA\CDS\

If you need to work on that data base from the Server itself, another copy of the software and Winisis system files shall be installed on the Server, in a different folder, for example:

```
C:\WISISRES
          |__BG
          |__CTL3D
          |__DOC
          |__MENU
          |__MSG
          |__PROG
          |__WORK
      ......|__DATA
```

Server's C:\WISISRES\ folder will contain a file:

SYSPAR.PAR mainly including:

1=C:\WISISRES\PROG\
2=C:\WISISRES\MENU\
3=C:\WISISRES\MSG\
4=C:\WISISRES\WORK\
5=C:\WISISRES\DATA\
14=1
101=FR
141=C:\WISISRES\BG\
.....

Server's directory C:\WISISRES\DATA\ will contain the Basei.PAR files, such as:

CDS.PAR:

1=D:\WINISIS\DATA\CDS\
2=D:\WINISIS\DATA\CDS\
3=D:\WINISIS\DATA\CDS\
4=D:\WINISIS\DATA\CDS\
5=D:\WINISIS\DATA\CDS\
6=D:\WINISIS\DATA\CDS\
7=D:\WINISIS\DATA\CDS\

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8=D:\WINISIS\DATA\CDS\
9=D:\WINISIS\DATA\CDS\
10=D:\WINISIS\DATA\CDS\

A data base (*i.e*. CDS) opened from a local machine, will show the following path:

H:\WINISIS\DATA\CDS\

The same data base opened from the Server machine will show the following path:

D:\WINISIS\DATA\CDS\

It is the very same data base, located in the same directory on the Server's Hard disk.

Note that on the Server's Hard disk the directories C:\WISISRES\DATA\ and D:\WINISIS\DATA\ are and must be different because the files xxx.PAR they contain are specific to the Winisis installations accessing the data base (Server or clients PCs).

14.2 LibSys

LibSys is the prime mission of New Delhi based software company - Info-Tek Consultants Pvt. Ltd., engaged in providing software solutions for General Insurance and ERP/CRM since 1984. Its continuous growth for the last 12 years, has made LibSys a defacto standard for libraries in India. Its acceptance in global market further strengthens its popularity across the country as the most field proven library system in a wide spectrum of libraries with unmatchable depth in functionality and features.

LibSys is an integrated multiuser library management software, that caters to the needs of an advanced library and information professionals. It provides a tree structure system with each system comprising of several sub-systems having unmatchable depth in functionality.

It has a powerful and user-friendly WEB-OPAC along with Windows-based OPAC.

It runs on various platforms such as WINDOWS (95/98/NT/2000/XP), UNIX (various flavors), LINUXM, etc. Further, it adheres to standards such as MARC and Z39.50 that makes it suitable for cooperative networking and resource sharing.

The LibSys systems at a glance:

- Acquisition System
- Cataloguing System
- Circulation System
- Serial System
- Article Indexing System
- OPAC System

Acquisition System

It deals with approval and ordering of library materials, monitoring their receipt, invoice processing and accessioning. It also maintains expenditure and budget analyses under a variety of accounts/ heads.

The Acquisition process consists of:

- Selecting materials for a library;
- Placing orders for the supply of books to be purchased;

Notes

- Processing materials received as gifts;
- Arranging for exchange of books;
- Receiving the books in the library;
- Accessioning them; and
- Passing the bill for payment for the books purchased.

Cataloguing System

It provides online catalogues in various orders maintained in traditional libraries. Additionally, it makes available instant listings under a variety of searchable fields to suit the requirements of a modern reference center.

Other than data entry facility, the system has the additional facility to accept data in standard machine readable formats such as CCF (ISO-2709), MARC (ANSI-Z39.x), etc. This makes import/export of bibliographic data in standard exchange formats possible. The system provides facilities to generate bibliographies, current awareness services and selective dissemination of information (SDI). Multimedia files can be attached and viewed in OPAC, meeting the requirements of certain specific libraries.

Circulation System

It maintains up-to-date membership records as well as the latest status of the collection meant for circulation. It facilitates printing of bar-coded ID cards, along with an optional facility to attach member's photograph. It performs all the functions related to circulation, providing suitable checks at every stage. It also takes care of infrequent but routine functions such as bindery record management, books on display in the library, latest additions to the library, etc.

Serial System

It provides control of subscription of periodicals and subsequent monitoring of the scheduled arrival of individual issues.It maintains records of the budget sanctioned for serials under different categories, amounts spent, thus providing complete budgetary control. It also handles serials which are received gratis or in exchange.

Article Indexing System

It provides the facility to create and maintain a separate articles database. It facilitates special services such as SDI, listing of current articles, bibliographies, etc.

OPAC System

As the acronym suggests, it provides an Online Public Access Catalogue. The bibliographic databases can be accessed with printed indexes. The system includes a word-based search facility using Boolean operators that can narrow down a search to meet very specific needs. Additional features of this system are:

- Periodic listing of recent additions to the library;
- Members can find the materials checked-out to them; and
- Reserve materials that are currently in circulation.

WEB-OPAC System

It is an optional module and provides an advanced GUI interface to enable searching of the library database through an industry standard Web browser having all the features of OPAC.

14.3 Soul

Notes

Software for University Libraries (SOUL) is a state-of-the-art integrated library management software designed and developed by the INFLIBNET Centre based on requirements of college and university libraries. It is a user-friendly software developed to work under client-server environment.

The software is compliant to international standards for bibliographic formats, networking and circulation protocols. After a comprehensive study, discussions and deliberations with the senior professionals of the country, the software was designed to automate all house keeping operations in library.

Notes The software is suitable not only for the academic libraries, but also for all types and sizes of libraries, even school libraries. The first version of software *i.e*. SOUL 1.0 was released during CALIBER 2000. The database of the SOUL 1.0 is designed on MS-SQL and is compatible with MS SQL Server 7.0 or higher. The latest version of the software *i.e*. SOUL 2.0 will be released by the end of the year 2008. The database for new version of SOUL is designed for latest versions of MS-SQL and MySQL (or any other popular RDBMS). SOUL 2.0 is compliant to international standards such as MARC 21 bibliographic format, Unicode based Universal Character Sets for multilingual bibliographic records and NCIP 2.0 based protocols for electronic surveillance and control.

Major Features and Functionalities

Following are the strong features of SOUL:

- UNICODE based multilingual support for Indian and foreign languages;
- Compliant to International Standards such as MARC21, AACR-2, MARCXML;
- Compliant to NCIP 2.0 protocol for RFID and other related applications especially for electronic surveillance and self check-out & check-in;
- Client-server based architecture, user-friendly interface that does not require extensive training;
- Supports multi-platform for bibliographic database such as My SQL, MS-SQL or any other RDBMS;
- Supports cataloguing of electronic resources such as e-journals, e-books, virtually any type of material;
- Supports requirements of digital library and facilitate link to full-text articles and other digital objects;
- Support online copy cataloguing from MARC21 supported bibliographic database;
- Provides default templates for data entry of different type of documents. User can also customize their own data entry templates for different type of documents;
- Provides freedom to users for generating reports of their choice and format along with template and query parameters;
- Supports ground-level practical requirements of the libraries such as stock verification, book bank, vigorous maintenance functions, transaction level enhanced security, etc.;

Provides facility to send reports through e-mail, allows users to save the reports in various formats such as Word, PDF, Excel, MARCXML, etc.;

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- Highly versatile and user-friendly OPAC with simple and advanced search. OPAC users can export their search results in to PDF, MS Excel, and MARCXML format;
- Supports authority files of personal name, corporate body, subject headings and series name;
- Supports data exchange through ISO-2709 standard;
- Provides simple budgeting system and single window operation for all major circulation functions;
- Strong region-wise support for maintenance through regional coordinators. Strong online and offline support by e-mail, chat and through dedicated telephone line during office hours; and
- Available at an affordable cost with strong institutional support.

Task What is SOUL? Explain the major features of SOUL.

Modules

The SOUL 2.0 consists of the following modules. Each module has further been divided into sub modules to cater to its functional requirements:

- Acquisition
- Catalogue
- Circulation
- OPAC
- Serial Control
- Administration.

The in-built network feature of the software will allow multiple libraries of the same university to function together as well as access to the distributed databases installed at various university libraries and union catalogue mounted at INFLIBNET using VSAT network.

Acquisition

The module enables library staff to handle all the major functions, such as:

- Suggestions management;
- Order processing, cancellation and reminders;
- Receipt, Payment and budgetary control;
- Master files such as currency, vendors, publishers etc.; and
- Reports.

Catalogue

Catalogue module is used for retrospective conversion of library resources. It also facilitates library staff to process of the newly acquired library resources. The strong features of catalogue module are:

- Allows cataloguer to create their own templates for data entry of different library resources;
- Different templates for leaders and fixed fields of MARC21;

Notes

- Allows user-generated customized reports;
- Facilitates authority database of person name, corporate body, subject headings and series name;
- Supports copy cataloguing in MARC21 format by using ISO-2709 standard;
- Master database of publishers;
- Multi-lingual database by using Unicode Character set; and
- Supports full MARC 21 bibliographic format.

Circulation

This module takes care of all possible functions of circulation. Sufficient care has been taken in designing this module starting from membership management, maintenance and status of library items, transaction, ILL, overdue charges, renewals and reminders, search status and report generation according to the status of the items. The circulation module is fully compliant with the NISO Circulation and Interchange Protocol (NCIP) version 2.0 for electronic surveillance and RFID based transaction of the items. Major functions of the circulation module:

- Membership;
- Transaction;
- Inter-library loan;
- Over due charges;
- Reminder;
- Search status;
- Maintenance of the items such as binding, lost, replace, missing, withdrawl, etc.; and
- Report generation based on the various requirements.

Online Public Access Catalogue (OPAC)

One of the major attraction of SOUL is its robust Online Public Access Catalogue (OPAC). The OPAC has simple and advanced search facility with the minimum information of the item by using author, title, corporate body, conference name, subject headings, keywords, class number, series name, accession number or combination of any of two or more information regarding the item. Major functions provided in the module are:

- Simple Search;
- Boolean Search;
- Advanced Boolean Search;
- Displaying and downloading of records in MS Excel, PDF or MARCXML; and
- Search support for the items that are in the acquition process in the library.

Serial Control

Managing serials is the most complicated job for a library. The module keeps track of serials in the library effectively and efficiently. The searial control module is developed based on the KARDEX system and has following functions built into it:

- Suggestions;
- Master databases;

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- Subscriptions;
- Check-in of individual issues of journals;
- Payment, reminder, binding, and title history;
- Export/import by using ISO 2709 bibliographic exchange format;
- Article indexing of journal/book articles;
- Cataloguing of electronic journals; and
- Keeps track of the history changes of the journals.

Administration

In addition to the features available in the Administration Module of the SOUL 1.0, some more features have been added to the administration module of the SOUL 2.0. With the inputs from the various SOUL users and requirements of the library staff and their user rights. The module has been divided into three major sections for accommodating the new features; those are User management, System Parameters and Masters. The administration volume provides the following These Administration module include following features:

- Grouping of users based on the policy;
- Transactional rights over the systems;
- Transaction level security to users;
- Various configuration settings such as labels, e-mail and other parameters related to the software use; and
- Common master databases being used in modules.

14.4 Koha

KOHA is web-based ILS, with a SQL database backend with cataloguing data stored in MARC and accessible via Z39.50. The user interface is very configurable and adaptable and has been translated into many languages. KOHA has most of the features that would be expected in an ILS, including:

- Simple, clear interface for librarians and members (patrons)
- Various Web 2.0 facilities like tagging and RSS feeds
- Union catalog facility
- Customizable search
- Circulation and borrower management
- Full acquisitions system including budgets and pricing information (including supplier and currency conversion)
- Simple acquisitions system for the smaller library
- Ability to cope with any number of branches, patrons, patron categories, item categories, items, currencies and other data
- Serials system for magazines or newspapers
- Reading lists for members.

Overview

Koha as created in 1999 by Katipo Communications for the Horowhenua Library Trust in New Zealand, and the first installation went live in January 2000.

Notes

From 2000, companies started providing commercial support for koha, building to more than 20 today.

In 2001, Paul Poulain (of Marseille, France) began adding many new features to Koha, most significantly support for multiple languages. By 2010, Koha has been translated from its original English into French, Chinese, Arabic and several other languages. Support for the cataloguing and search standards MARC and Z39.50 was added in 2002 and later sponsored by the Public Library. Paul Poulain co-founded BibLibre in 2007.[6]

In 2005, an Ohio-based company, Metavore, Inc., trading as LibLime, was established to support Koha and added many new features, including support for Zebra sponsored by the Crawford County Federated Library System. Zebra support increased the speed of searches as well as improving scalability to support tens of millions of bibliographic records. In 2010, LibLime was acquired by another vendor, PTFS.

In 2009 a dispute arose between LibLime and other members of the Koha community. The dispute centred on LibLime's apparent reluctance to be inclusive with the content of the sites and the non-contribution of software patches back to the community. A number of participants declared that they believed that LibLime had forked the software and the community. A separate web presence, source code repository and community was established. The fork continued after March 2010, when LibLime was purchased by PTFS.

In the 2010 LibraryTechnology.org survey of ILS perception, independent Koha support and Koha support from ByWater Solutions outranked support from LibLime in every single question.

On 8 April, Domingo Arroyo announced that the Spanish Ministry of Culture is spinning KOBLI, a customised version of Koha.

In 2007 the state of Vermont began testing the use of Koha for all Vermont libraries. At first a separate implementation was created for each library. Then the Vermont Organization of Koha Automated Libraries (VOKAL) was organized to create one database to be used by libraries. This database was tested in 2010 and is being rolled out in 2011. As of May, twenty-six libraries have chosen to adopt Koha and thirteen have moved to the shared production environment. Previously Vermont used software from Follett.

Current Status

The latest stable release of the Koha is 3.4.4 (written as Koha-3.04.04 in the download file).

Koha is currently a very active project. According to ohloh, it has a [v]ery large, active development team and a [m]ature, well-established codebase [18]. The analysis of the size of the code base may be deceptive because koha stores user interface translations alongside actual source code and ohloh cannot always distinguish them.

Koha is an open source Integrated Library System (ILS), used world-wide by public, school and special libraries. The name koha comes from a Mãori term for a gift or donation.

- Now, your users can do it them—MORE ON VIRTUAL SHELVES > selves from anywhere, online! Your library's catalog will be more Public shelves can be viewed by all, relevant to your users than ever before, and will free up staff time but edited only by the shelf's creator. Private shelves can only be viewed for those services that truly require a library professional. and edited by the creator. Free Shelves bring Readers' Advisory to a whole new level by letting your users collaborate to > create + share book lists create evolving lists which everyone can enjoy.
- Koha's Virtual Shelves enable staff and patrons to create permanent book lists which can be shared with others. Your staff can easily create online Reading Lists for patrons. Best of all, Virtual Shelf items link directly to your library catalog! Virtual Shelves come in three varieties

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-public, private and free—which can be enabled or disabled to reflect your library's unique policies. Library staff can use Virtual Shelves to create recommended reading lists or track popular book clubs and series. > track acquisitions via RSS RSS (Really Simple Syndication) is a convenient way to keep up with new content on your favorite website. LibLime integrates RSS feeds into your catalog, so instead of having to click through or search the various sections of your library's catalog to see what's new, patrons can opt-into an RSS feed which pushes that information directly to their computer!

- Koha ZOOM's web-based Staff Client has been optimized for efficient task-switching, and streamlined to minimize page reloads. In fact, the style and layout > easy navigation of the interface were chosen by librarians who use it Mouse-based navigation with optional shortcut keys streamline efficiency. daily--a great example of Koha's user-centric design. > auto e-notices LibLime's comprehensive support and training options Auto e-notices for overdues and reserves save staff make the transition from your legacy system time. to Koha a smooth one for you and > full acquisitions Koha's feature-rich full acquisitions module makes your staff.
- Usable interfaces ordering items a cinch. Additionally, it provides your Customize. cataloging team with the tools they need to manage mean you can get back to the MARC records for these items as they enter the don't settle for 'almost'. Customize library's collection. Here are a few of the highlights: the fun part of being a Koha's interface to truly support your • Full serials support librarian! staffs' workflow! • Manage orders from vendors • Budgets and pricing information • Management of borrower suggestions • Archives Staff Client. Customize it. ! > Z39.50 support MORE ON > Full-featured WEB-BASED STAFF Native Z39.50 server and client for resource sharing. CLIENT > Koha's staff • Multiple libraries and transfers client is web-based. > MARC management tools This means there is no Koha's MARC support is rich, encompassing both • Circulation and fines application to install on MARC21 and UNIMARC. Combined with MARC edit- every staff computer. ing and management tools, cataloging staff can easily • Patron management Additionally, updates and efficiently manage a library's collection of MARC happen server-side-- so records. These tools include: • Acquisitions module no more waiting for bug fixes to be applied on • MARC frameworks to support • Serials management each computer. monographs, serials, etc. • MARC authorities control • Authorities control • Serials management o Support for LOC, Dewey or any • Integrated Z39.50 for resource sharing other classification • Printing functions for barcode labels, ID cards, and overdue notices.
- Reduced costs " The software itself is free. You pay only for the product support and training (if any) that you need. When a user The ROI speaks for itself. Open source is cost-sponsors development of new functionality, the whole community benefits. Software functions are paid for only once making open-source software cost-efficient.
- Libraries using open-source software benefit from many advanced affordable and technologically-sound choice. technology solutions that they otherwise could not afford to develop themselves yet they still have the option to steer development if they so desire. Moreover, since open-source software developers like LibLime use a business It enables libraries to position them—model that relies on providing support and training for software rather than selling the right to use the software, the " per-library support costs go down. Just think how you can re-allocate monies currently tied up in high annual licens- selves to be prepared for technology ing fees. changes in the future. > innovate + collaborate Open source empowers libraries to innovate and collaborate.
- Not only can you download and use open-source—Doug Dotterer, software for free, you're free to alter it in any way you see fit. By sponsoring development of new features for Koha Director Stow-Munroe Falls Public Library through LibLime, you don't need an IT staff to make your ideas a reality. No more waiting to see if your software vendor decides to incorporate your suggestions into the next version. Koha puts the power in your hands. This isn't just a theoretical model: as you read this, libraries worldwide are actively collaborating together

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to make Koha the future of library software. You can too. > choose your support In a proprietary software development model, you pay high license fees to use the software.

- If your vendor isn't providing you with adequate support or isn't allowing you the freedom to customize and improve the software to Dollars and sense of Koha. meet your needs, switching vendors means switching software. And then there's the matter of migrating your data from one vendor to the next. With open source, switching to another service provider or migrating to an in-house solution is simple. In fact, at LibLime, if managing your library software in-house is a goal we can help you achieve it. Further, an open-source software development model means that your data is YOUR data.
- Our customers have unfettered access to all of their data all of the time in standard formats at no additional charge. Invest. > the future is 'open' no vendor lock-in. No need to switch software just because you are Open source in libraries has its challenges as well. Till now, library software vendors have built their businesses switching vendors. Long-term security, around a proprietary software development model, and, as a result, libraries have been slow to adopt open source. pure and simple. Many libraries simply do not have the in-house expertise to support open-source software development, and also don't have the ability to train staff on the use of the new technologies.
- They rely on software vendors to provide them with solutions. This is where LibLime comes in. We're informing libraries about the superiority of the open-source development model so they can provide their patrons with better technology services, faster and cheaper. And we make it possible for libraries to use open-source software by providing them with outstanding support and training options. Open source is here. It's growing. You can be a part of it.
- LibLime is the library community's most trusted provider of open-source solutions. Rather than sell software licenses for static, hard- to-customize software products, we're informing libraries about the benefits of open source, enabling them to make choices about how best to provide their communities and staff with better technology services. We enable libraries to use open-source software to its full potential by providing outstanding commercial support services, tailored to each customer's needs. ? Why choose > training + > development + > fully-managed support customization solutions With seasoned librarians on The freedom to customize is Hosting • Data Migration o staff, LibLime understands the one of the biggest advantages Installation & Configuration importance of staff training to of choosing open source. That's ensure a smooth transition when why LibLime offers software No IT staff is required to take switching software solutions. development and customiza-advantage of LibLime's fully- That's why we provide both tion services. By sponsoring managed solutions.
- We're pre-on-site and online training development of new features pared to take care of every level packages. through LibLime, your library of the migration process, from can help steer development of data extraction and standardiza-Since LibLime is a service—your ILS software. LibLime will tion to normalization and import oriented company, support is see to it that your features get into your new system. If you at the heart of what we do. contributed back to the larger have IT staff, LibLime is happy LibLime offers comprehensive library community, facilitating to work with you to leverage email and phone support. true collaboration. those resources.

Self Assessment

Fill in the blanks:

1. ..... is an integrated application programming language which allows the user to tailor the software to specific needs.
2. ..... is web-based ILS, with a SQL database backend with cataloguing data stored in MARC and accessible via Z39.50.

Notes

3. In ..... the user interface is very configurable and adaptable and has been translated into many languages.

14.5 Summary

- LibSys is the prime mission of New Delhi based software company—Info-Tek Consultants Pvt. Ltd., engaged in providing software solutions for General Insurance and ERP/CRM since 1984.
- LibSys is an integrated multiuser library management software, that caters to the needs of an advanced library and information professionals.
- Software for University Libraries (SOUL) is a state-of-the-art integrated library management software designed and developed by the INFLIBNET Centre based on requirements of college and university libraries.
- Catalogue module is used for retrospective conversion of library resources.
- The circulation module is fully compliant with the NISO Circulation and Interchange Protocol (NCIP) version 2.0 for electronic surveillance and RFID based transaction of the items.

14.6 Keywords

Cataloguing System: It provides online catalogues in various orders maintained in traditional libraries.

Circulation System: It maintains up-to-date membership records as well as the latest status of the collection mean for circulation.

OPAC System: As the acronym suggests, it provides an online public access catalogue.

14.7 Review Questions

1. Explain the features of CDS/ISIS software.
2. How many platforms LibSys run?
3. What do you mean by cataloguing system?
4. Write a note on OPAC system.

Answers: Self Assessment

1. CDS/ISIS Pascal and the ISIS_DLL 2. Koha 3. Koha

14.8 Further Readings

Books

1. Devarajan, (G). *Information technology in libraries.* Delhi: Ess Ess, 1990.
2. Ravichandra Rao, (IK): *Library automation.* New Delhi: Wiley Eastern.
3. Rowley, (J.) *The electronic library.* 4th ed. London: LA, 1998.
4. Satyanarayana, (NR): *A manual of computerisation in libraries.*

Online link

http://www.libsys.co.in/companyprofile_overview.html

http://librarynoob.wordpress.com/2010/11/06/koha-ils-right-for-your-library/